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THESIS

JOINT ONLINE THESIS AND RESEARCH SYSTEM (JOTARS)

by

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September 2006

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JOINT ONLINE THESIS AND RESEARCH SYSTEM (JOTARS)

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ABSTRACT

The purpose of this thesis is to develop a web-enabled database which facilitates research-related connections and communication among Naval Postgraduate School (NPS) students, professors, and DOD organizations. The proposed name for the prototype website is the Joint Online Thesis and Research System (JOTARS). The specific functional objectives of JOTARS are to establish standard infrastructure and processes that allow DOD organizations to dynamically propose research topics, view research in progress, suggest topics for class projects. JOTARS will also enable NPS students to conduct refined searches of proposed research topics.

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EXECUTIVE SUMMARY

The purpose of this thesis is to develop a web-enabled database which facilitates research-related connections and communication among Naval Postgraduate School (NPS) students, professors, and DOD organizations. The prototype was modeled after the way eBay (www.ebay.com) makes connections between buyers and sellers. The proposed name for the prototype web site is the Joint Online Thesis and Research System (JOTARS). The specific functional objectives of JOTARS are to establish standard infrastructure and processes that allow DOD organizations to dynamically propose research topics, view research in progress, and suggest topics for class projects. JOTARS will also enable NPS students to conduct refined searches of proposed research topics.

Graduate students at NPS are tasked with a broad spectrum of research which can range from class projects such as building basic databases to thesis research in rocket science. Generally, DOD organizations are uninformed about how to participate and benefit from student research. When operational, JOTARS will be a great tool for NPS to make contact with and provide research support to DOD organizations while enhancing the educational experience of students.

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I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to develop a web-enabled database which facilitates research-related connections and communication among Naval Postgraduate School (NPS) students, professors, and DOD Organizations. The prototype was modeled after the way eBay makes connections between buyers and sellers. The proposed name for the prototype web site is the Joint Online Thesis and Research System (JOTARS). The specific functional objectives of JOTARS are to establish standard infrastructure and processes that allow DOD organizations to dynamically propose research topics, view research in progress, and participate in class projects. JOTARS will also enable NPS students to conduct refined searches of proposed research topics.

B. ORGANIZATION

This thesis is organized as follows:

Chapter I provides an overview background and problem characterization.
Chapter II provides the strategic concept and vision.
Chapter III describes existing infrastructure and database schema
Chapter IV describes process models and provides screen shots
Chapter V describes development methods and lessons learned.
Chapter VI provides an implementation strategy.
Chapter VII provides summary / conclusions and opportunities for future research and improvements.

C. BACKGROUND

The mission of the Naval Postgraduate School (NPS) is “To provide relevant and unique advanced education and research programs in order to increase the combat effectiveness of United States and allied armed forces and enhance the security of the United States.”[1] Research is an integral part of the school's mission and students' curricula. Graduate students are tasked with a

broad spectrum of research which can range from class projects such as building basic databases to thesis research in rocket science or the war on terrorism. Class projects are a significant part of NPS student research efforts and often lead to thesis research.

D. PROBLEM CHARACTERIZATION

Processes and infrastructure are not in place that allow DOD organizations to dynamically propose research topics for NPS students to access and search topics. To better characterize the problem, one must take the view from the perspectives of the different stakeholders, which include DOD organizations, students, professors, curricula sponsors and the school administration.

1. Stakeholders

a. DOD Organizations

Many DOD organizations are unaware of the opportunity or process to utilize NPS students for research, and this is especially the case with class projects. DOD organizations are able to search completed thesis research but are unable to search or view research topics in progress. Without the ability to view research in progress, organizations may miss the opportunity to save both time and money and instead start from the beginning with a new research initiative. Attempts to communicate with professors and students must be proactive and consist of a nonstandard assortment of e-mails, site visits and telephone calls. Travel is often required for representatives of DOD organizations to speak directly with professors and students. This face-to-face interaction certainly has its benefits; however, it is the most costly method of communication. The biggest problem is identifying and obtaining an audience with professors interested in promoting their research and with students seeking research topics in a shared area of interest.

b. NPS Students

Students currently find thesis topics by attending lectures, taking class projects to the next level, referrals from faculty members or referrals from curriculum sponsors. When attending lectures or seminars, students are not always provided reference material for later referral. One must also consider that every student does not attend all lectures and seminars and is unaware of many proposed research topics. E-mail is another method used to reach students, but e-mail messages are not always read or correctly targeted. For projects proposed via e-mail and seminars, without follow-up, students are unaware if proposed topics remain valid.

Class project research begins early and is continuous throughout a student's tour at NPS. Students are often required to find topics for class projects with little notice. Students may rely on experience or connections at past or future commands to identify a focus area, or they may simply improvise a scenario. When the research is not geared toward a client, it is certainly less gratifying for students to know that no one will benefit from their hard work. Students are also less likely to gain the same degree of experience from a made-up scenario.

c. NPS Professors

Attempts by NPS professors to communicate with students and sponsors occur primarily through e-mail, bulletin board postings, lectures and telephone calls. Some professors work in programs, such as the Acquisition Research Program in the Graduate School of Business and Public Policy at NPS, which offer an opportunity to post on the intranet. Connecting with students within a professor's own classes or academic department is much less difficult than reaching students from other academic departments. There are team research projects, which would benefit from having representative students from different curriculums. Obtaining a forum to introduce their research topics is limited. Timing is also important because many students have a limited

timeframe to select thesis topics and may select a topic prior to a professor's scheduled presentation in a lecture series.

d. Curriculum Sponsors

Curriculum sponsors are the overseers of the structure of curricula, and typically, students work in the sponsor's respective community after graduation. Different curriculum sponsors have different degrees of involvement when it comes to assisting students to find appropriate research topics. The United States Marine Corps is an example of an involved curriculum sponsor, which assists Marines in finding research topics which benefit the Marine Corps. The Marine Corps representative at NPS serves as a go-between for Marine students and USMC commands. The Marine Corps representative would like to be able to follow-up and view the status of current Marine research. Other curriculum sponsors do not have the luxury of having a representative on campus and may only occasionally interact with students or travel to Monterey.

e. School Administration

School administrators, per NPS' mission, want students to support DOD organizations in their research efforts to the maximum extent possible. Administrators would also like to know what research is in progress and be able to measure the quantity and quality of research provided to DOD organizations.

2. Communication Methods

a. E-mail

E-mail is an inexpensive solution, which can be extremely effective in making the connections among students, professors and DOD organizations. However, it is not without its problems. The biggest problem, as with other methods of communication, is targeting the right group. If one chooses to send e-mail to everyone about everything, a spam problem is created and is not without cost. E-mail messages also become outdated whenever the status of

the research topic changes and updated e-mail messages may or may not be sent. Students who are not yet ready to begin their thesis research may save and refer to these messages when they are prepared to begin thesis research, but many do not. Senders of e-mail must also periodically resend proposed topics, which have not yet been accepted.

b. Flyers, Telephone, Face-to-Face

Posting flyers on campus bulletin boards can quickly become clutter to the point that they are no longer useful. However, there is benefit when used as the Business School uses them by augmenting their thesis topic web site. The rationale is that it provides students the opportunity to easily review proposed topics during class breaks. Telephone calls offer an effective means of communication, but the problem for DOD organizations is identifying the student who is interested in their project. Students may feel limited to communicating with people they know at past or future commands. Telephone calls also come in the form of passed messages through third parties and may become convoluted or forgotten. Face-to-face communication undoubtedly has benefits; however, it can also be costly in terms of both time and travel expenses.

c. Websites

The Research Department at NPS offers a website which offers information on research processes and points of contact. However, it does not compile or attempt to list proposed research topics. The Acquisition Research Program in the Graduate School of Business and Public Policy lists research topics for its students and also has a program which follows research through to publication. Other academic departments offer no such site or assistance.

The Air Force's Air University ResearchWeb [2] and the Joint Professional Military Education Prospective Research Topics Database (PRTD) [3] are two sites which offer searchable research topics over the internet. However, neither offers an opportunity for DOD organizations to post and manage their own topics. Rather, their databases are populated by conducting

annual data calls. There is also no solicitation for participation in class projects which would likely benefit the Air University in the same way it does NPS.

II. STRATEGIC CONCEPT

A. THE VISION

The basic concept is simply making connections between research students and DOD organizations desiring research. A good analogy of the communication challenge of linking students and sponsors is the web auction site eBay [4], which is extremely successful in linking a worldwide network of buyers and sellers. E-Bay's management of this communication process is almost exclusively automated which allows for a huge volume of sales with relatively few personnel. Some of the features eBay offers are as follows:

- Is the leading clearinghouse for buyers and sellers. Because of this, more buyers and sellers use the site which help fuels more growth and users.

- Tracks all items associated with user (i.e., sold items, purchased items, lost auctions, favorite searches, outbid items, and items marked for watching.)

- Enables buyers to search many different ways to find exactly what they want.

- Allows buyers the option of saving their favorite searches and will upon request send an e-mail notification when a new posting meets search criteria.

- Facilitates easy account creation for both buyers and sellers.

- Verifies user e-mail addresses as part of the registration process.

- Uses password authentication to ensure that users are only able to bid under their own name and modify only their own items.

- Sends automated e-mail notifications of bid conformations, outbid notices, expiration of postings, and notification of winners at auctions end.

- Creates an intuitive flow and user-friendly features which negates the requirement for user training.

- Automatically expires old items per business rules.

- Offers the opportunity to view archived items.

- Allows buyers and sellers to leave feedback about other buyers and sellers.

It is the author's view that some of these same features would be extremely useful in a web-enabled database which links NPS students and DOD organizations.

B. STAKEHOLDER SCENARIOS

Listed below are how typical stakeholders may interact and benefit from utilizing a research topics web-enabled database.

1. Students

Students would link to the homepage and, without logging-in, be able to browse or search proposed topics. They may also choose the advanced search option to find or filter topics by keyword, date posted, targeted curriculum, and by posting community organization. Search results and detail pages would provide contact information to inquire further or accept a proposed topic. They could also receive an e-mail alert when new research topics are posted which match the student's specified criteria. Class projects for a student's current and future courses would be searchable and allow the student time to choose to work with an associated organization or to find a different topic.

2. DOD Organizations

DOD organizations may first choose to search completed and current research without registering or logging-in. Class projects could also be searched and organizations could choose to associate with a class project after logging-in. Site registration would be automated and password or verification code would be e-mailed back to validate authorized users. After logging-in, they could post new

research topics or manage existing postings. Once a student accepts the organization's proposed research topic, the organization will be motivated to remove or unpublish the posting in order to stop receiving inquiries about a topic, which has already been accepted. When unpublishing a topic, the organization will be prompted to indicate whether a student has accepted their research topic. If the student has accepted this research, a follow-up survey would follow to measure the organization's satisfaction.

3. Professors

Professors would have the same ability as students and community organizations in searching and posting research topics. Professors may choose to associate or endorse research topic proposed by community organizations. This endorsement could identify the professor as a potential thesis adviser for students. Professors would also post class projects to give an advanced view for students and help solicit community involvement in class projects. Community support provided by a professor's class projects could benefit the professor's standing at NPS by demonstrating support for the school's mission in serving the fleet.

4. Curriculum Sponsors

Curriculum sponsors would log-on and post research topics like other organizations. They could also search proposed research topics and endorse topics, which meet their criteria. The students they sponsor would also be able to view and filter by curriculum sponsor endorsements.

5. School Administration

NPS school administrators would log-on and view statistics, which show the number of posted proposed topics, accepted topics, and class projects. Administrators could also drill down and view which topics were accepted and which organizations are associating with class projects. Additionally

administrators would analyze feedback from accepted projects and completed class projects. This feedback and statistical information would allow school administrators to quantify and qualify the research support provided to respective DOD organizations.

III. EXSISTING INFRASTRUCTURE AND DATABASE SCHEMA

A. EXSISTING INFRASTRUCTURE

1. BOSUN

BOSUN [5] is an on-line catalog for the Dudley Knox Library at NPS. Users are able to search for and download published unclassified NPS thesis work. Initially, integration of JOTARS with BOSUN was considered; however, the author wanted no part of BOSUN after learning it takes forty-five minutes for a professionally trained librarian to catalog a single thesis. The solution chosen was to keep JOTARS unconstrained by the library's complicated process of publishing items and simply provide a link to the completed research available through BOSUN.

2. PYTHON

PYTHON is a web site at NPS which manages NPS student and faculty course schedules, grades, instructor evaluations, musters (roll calls), recall information, classroom assignments, etc. It also has tables into which students enter their thesis topics after their proposals have been approved. Unfortunately this resource of current research in progress is not searchable. Initially, security concerns prevented access to research information over the internet. However, a solution of making available static tables (refreshed daily) for JOTARS to search research in progress would address those concerns. The developers of PYTHON thought enough ahead to provide a flag which allows students the choice of whether they would like their research to be made available over the internet.

3. NPS Internet Web Site

Because NPS already has a web site, an attempt was made to duplicate the look and feel of the NPS site during the development of JOTARS.

Additionally, the opportunity to put a link from the main school site would increase awareness and help direct traffic to JOTARS.

B. DATABASE SCHEMA

Cardinality, as described by Kroenke [6], is the maximum or minimum number of elements allowed on each side of a relationship. Figure 1 provides a logical view of the JOTARS' database and its relationships. There is a one to one relationship between users and departments. In this case, a user may only be associated with either zero or one department.[there are many cases where the relationship is one-to-many instead of one-to-one; e.g., joint appts for profs and interdisciplinary curricula] There are numerous one-to-many relationships. For example, a user may post several proposed projects, but each project will only have one owner. Many-to-many relationships are more complicated to deal with. For example, a professor may choose to be an advisor for many projects. Projects are also allowed to have many advisors. A join table was created to allow the database to logically keep track of what professors are associated with what projects. Join tables accomplish this by creating two one-to-many relationships. A join table was also required to resolve the many-to-many relationship between users and participation in class projects.

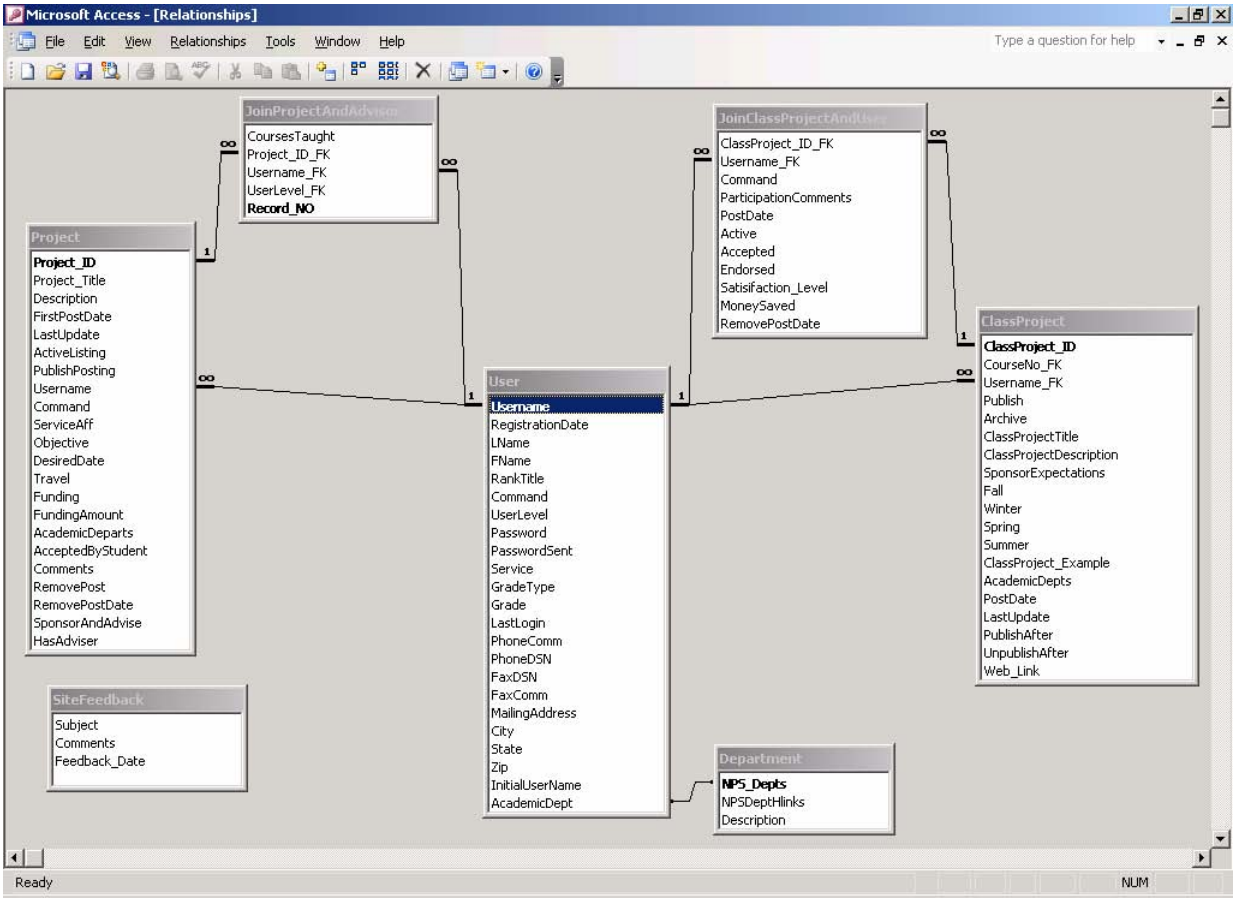

Figure 1. Database Schema

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IV. PROCESS MODELS, SCREEN SHOTS, REQUIREMENTS AND CODING

A. SITE HOME PAGE

The JOTARS Home page is shown in Figures 2 and 3. Convenience was given a higher priority than complexity by providing numerous choices for how users access the site. The “Browse as Guest” option shown in Figure 4 allows browsing without the need for registration or log-in. However, contact and detail information are not viewable. NPS intranet browsing allows NPS users to view all information; however, they are unable to post or associate with other postings. Logged-in users gain full control to the extent that their user level privilege allows. A single login like the implementation of Common Access Cards (CAC) for authentication could skip this page and bring users directly to a user home page vice a site home page.

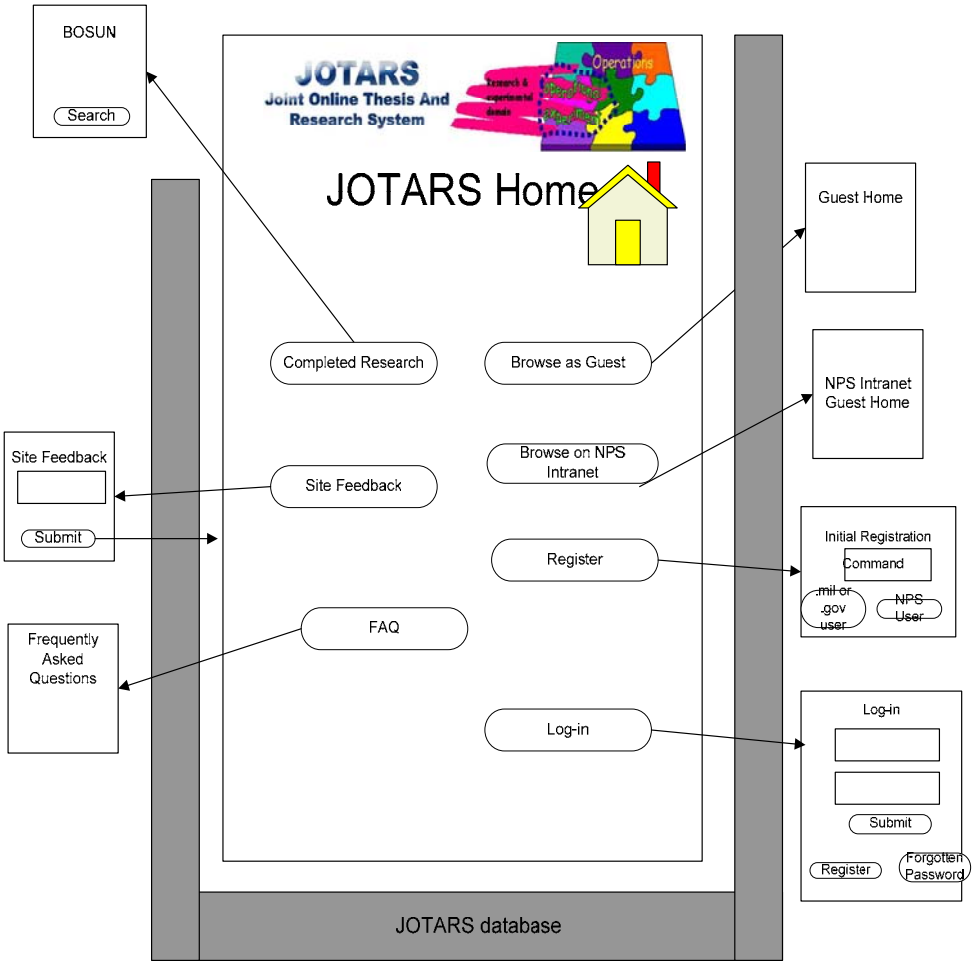

Figure 2. JOTARS Home

Figure 3. JOTARS Home Screen Shot

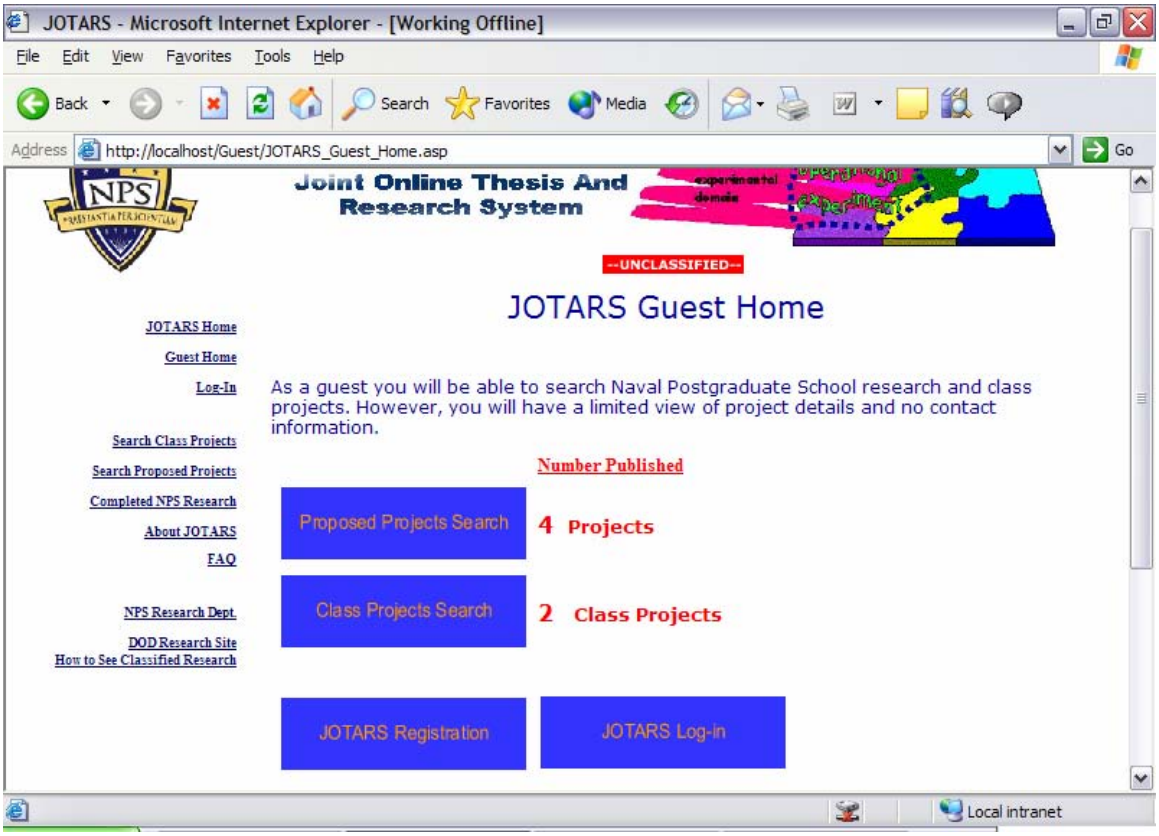

Figure 4. JOTARS Guest Home Screen Shot

B. USER HOME PAGE

The user home page is customized depending on the privilege level of the user. All projects and class projects the user has posted, as well as other items they are associated with, will be listed. Figure 5 shows the user home page and many of its links. The author found that building user home page and its associated recordsets very challenging page. Dreamweaver offers a "show-if" server behavior which was used in conjunction with record sets to customize user views. For example, for class projects, a record set was used to identify whether or not the current user is a NPS faculty member or not. If the user is a faculty member then the class project table will be viewable. Additional record sets and "show-if" functions were used to identify which projects belong to the current logged-in user. Figure 6 shows development views as seen in

Dreamweaver, and Figures 7 and 8 are screen shots of the many server behaviors associated with the User Home Page.

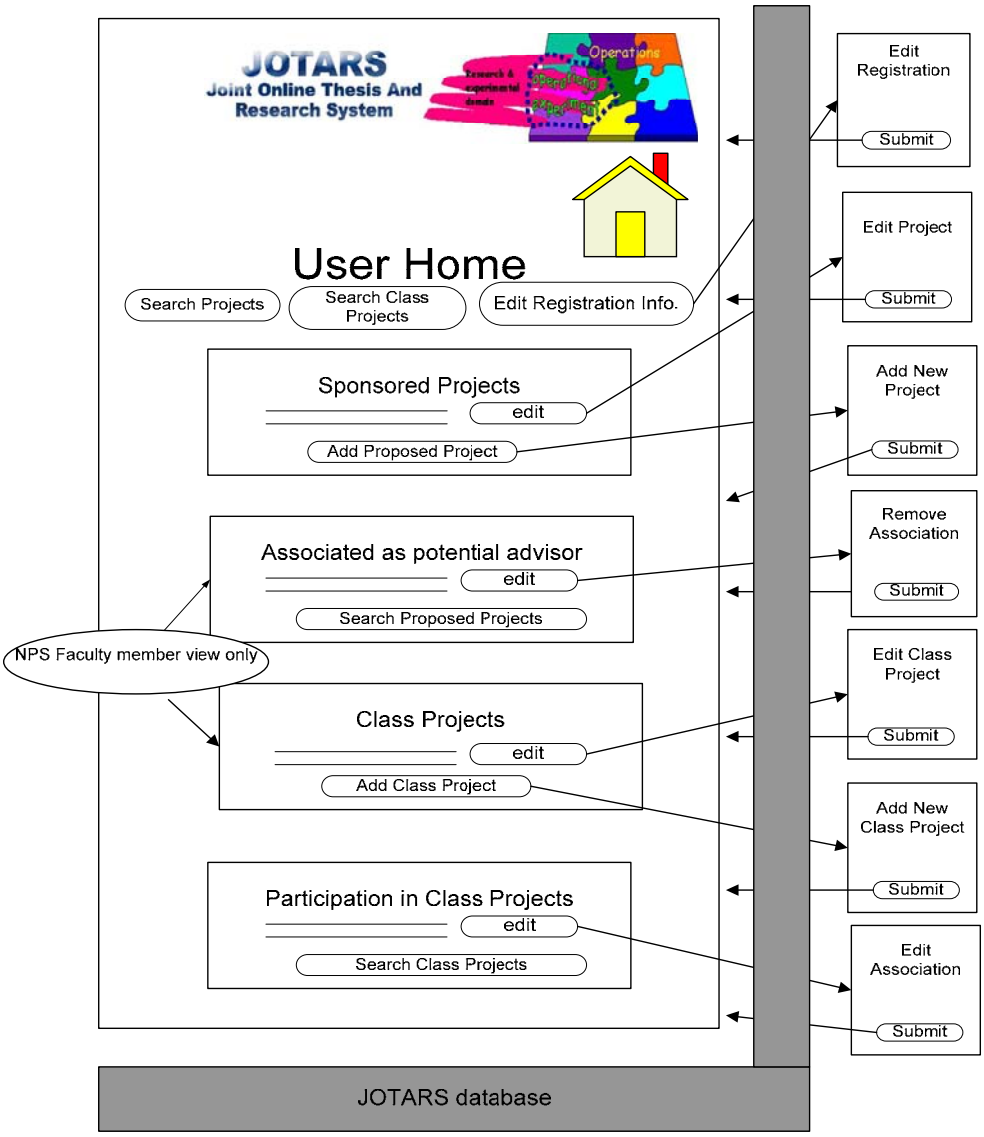

Figure 5. User Home Page

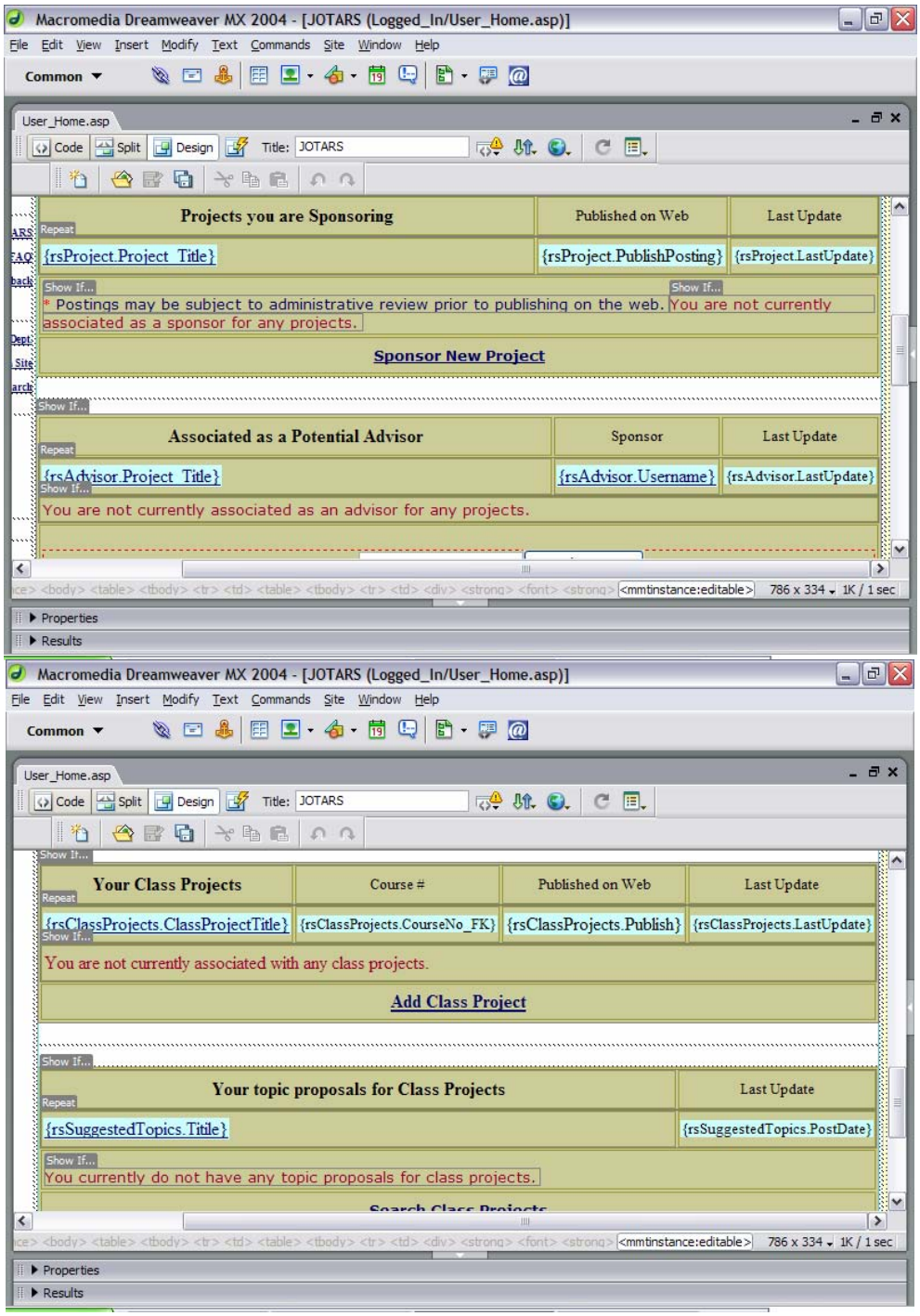

Figure 6. User Home Development Views

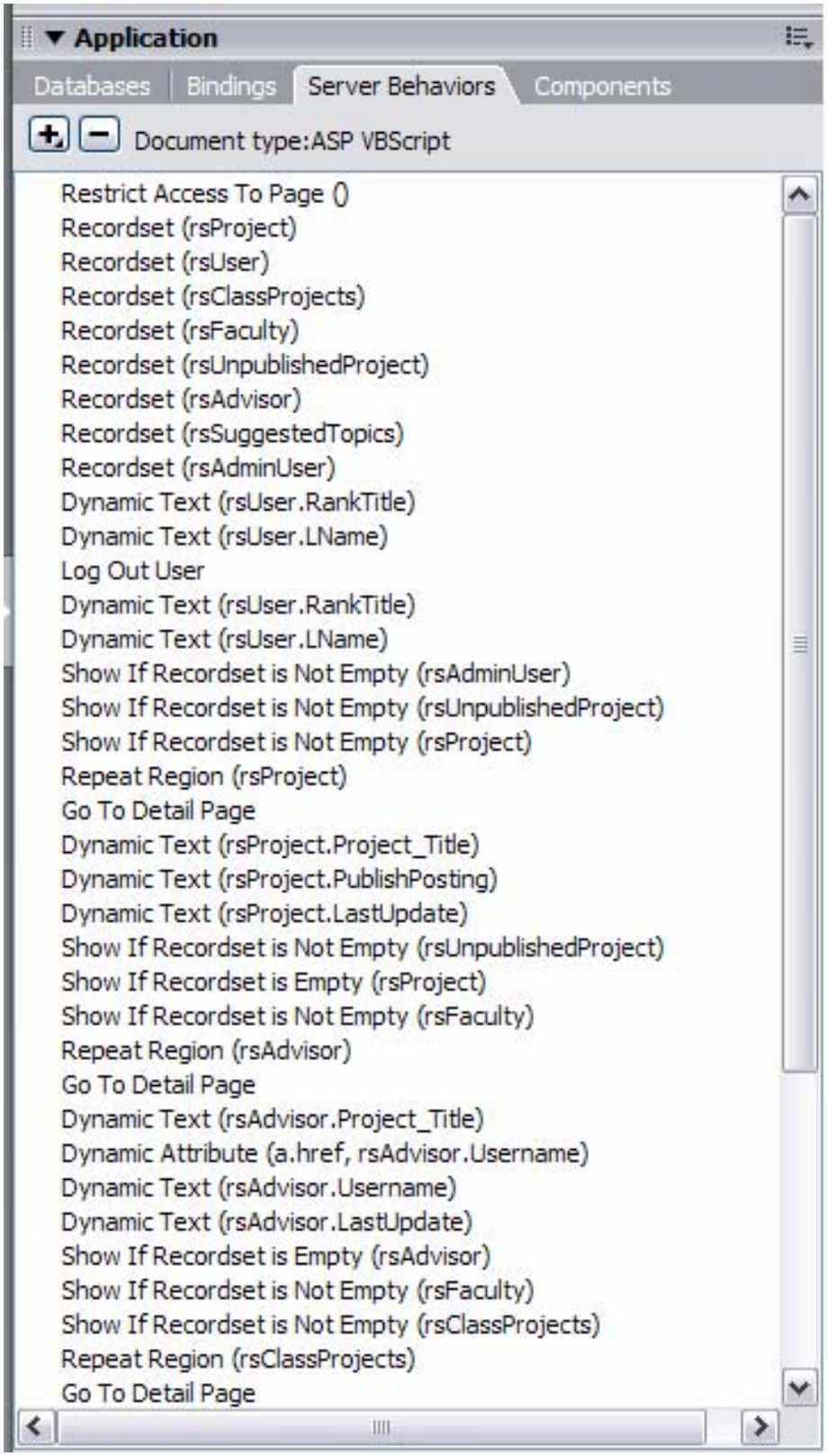

Figure 7. User Home Server Behaviors

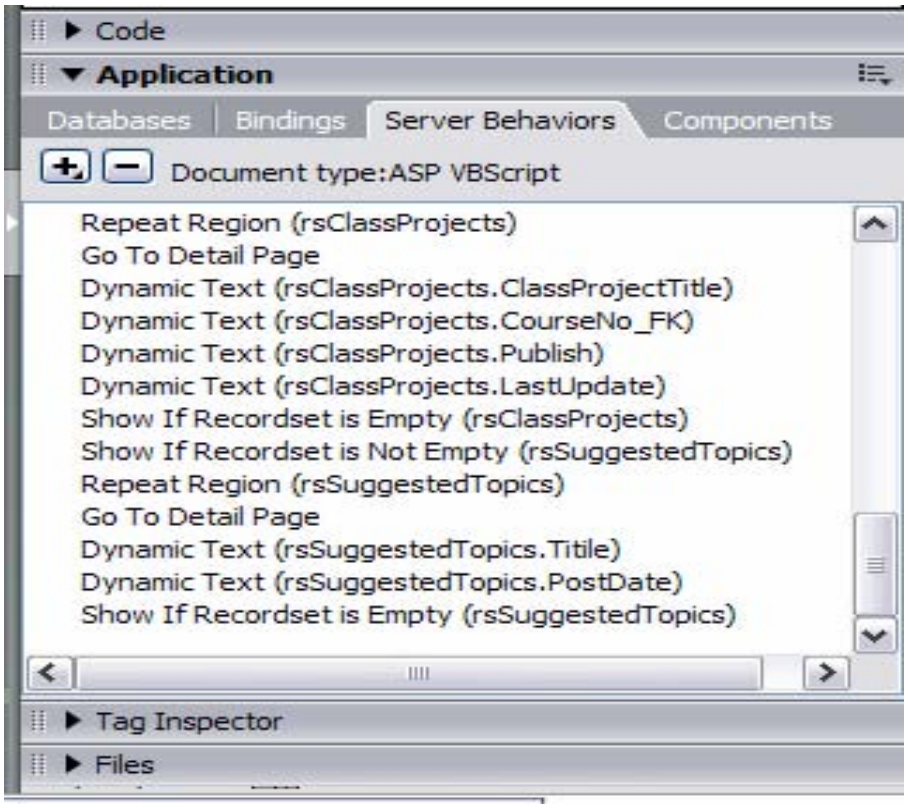

Figure 8. User Home Server Behaviors Continued

Numerous record sets were created in order to customize user pages. Figure 9 below is an example of a record set, which would list all of the class projects with which a user has an association. If the record set is empty then the statement, “You are not currently associated with any class projects.”, would appear as seen in Figure 10. As the complexity of record sets increased, queries in the database were utilized in some cases as they are much easier to build than record sets.

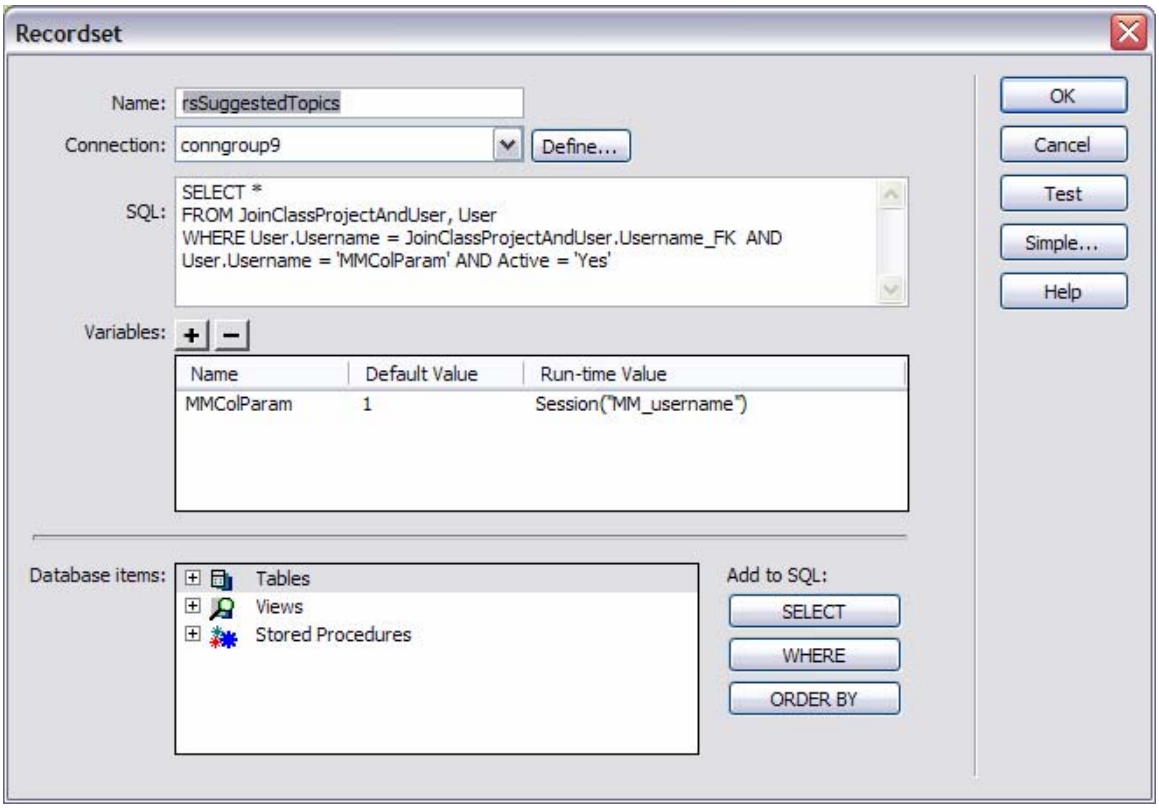

Figure 9. Record Set Example

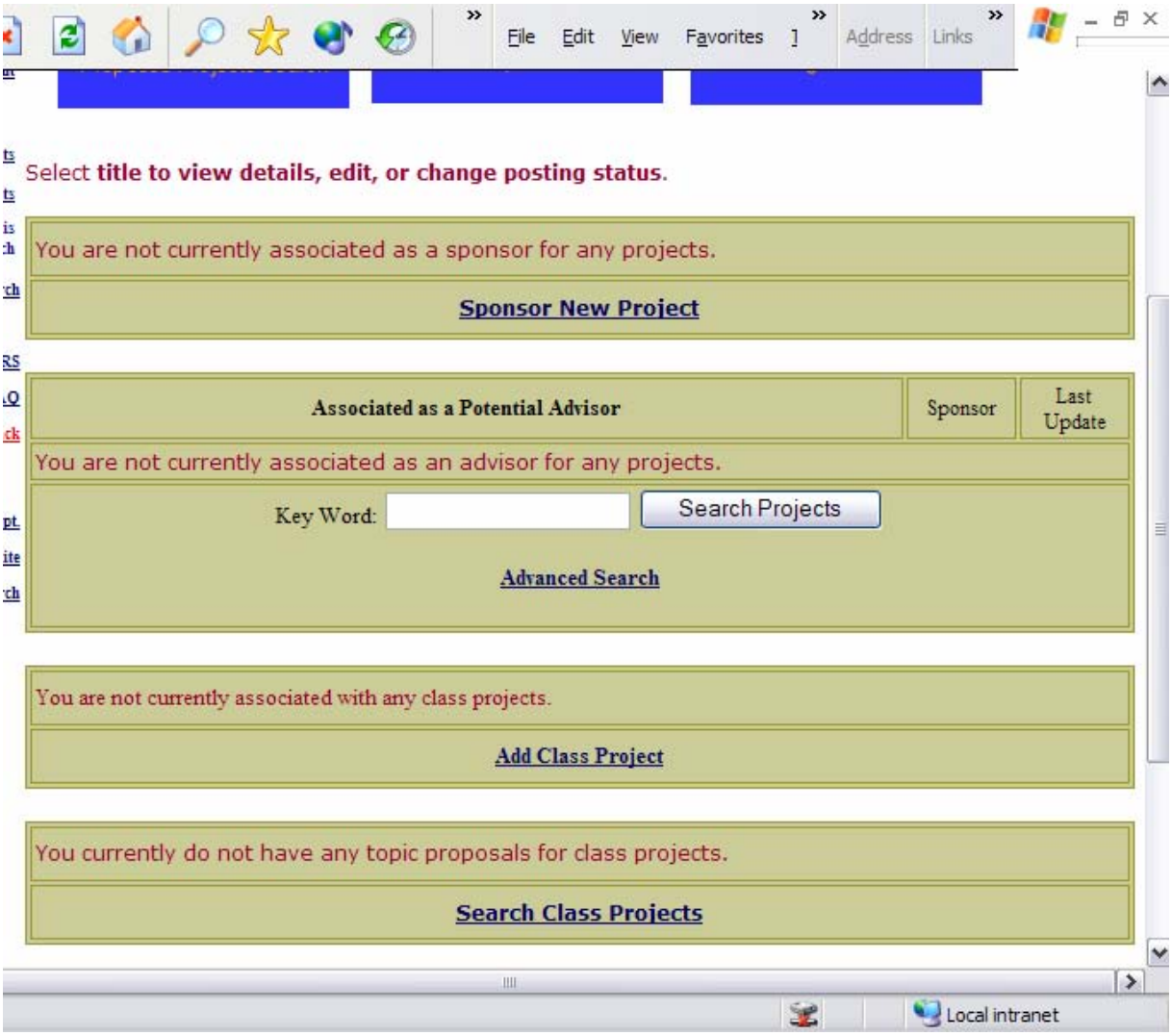

Figure 10. User Home Screen Shot

C. REGISTRATION

The initial registration forces a choice to determine to which e-mail domain users belong. NPS users complete their registration on the NPS intranet which requires a username and password to use. Passwords are then e-mailed to users' .mil, .gov. or nps.edu e-mail addresses in order to achieve some degree of access control.[the NPS intranet is already on the .edu domain…?] An individual's command is selected from a list of validated users. If a user's command is already in the database, it will appear in a drop down menu on the

initial registration page. Once selected it will write to the command field of the next registration form. This is meant to prevent different spellings for same commands. If their command was not available on the dropdown list, they will have the opportunity to type in their command. Form validation is used to ensure all mandatory fields are completed and to help prevent unauthorized users from registering. Some problems were encountered with some NPS users who chose to follow the .mil path and were denied the opportunity to request or use higher privilege levels. A better solution would be either to share access on the PYTHON server or to populate registration form hidden fields which could not be changed. This would have the potential to eliminate the authentication process for NPS users. The most optimal solution would be to use government issued Common Access Cards (CAC) which would solve the authentication issues and make things less complicated. Figure 11 illustrates the current process. Figures 12 and 13 are screen shots of the two-step input process for registration. Figure 14 is a Dreamweaver view of the edit registration page.

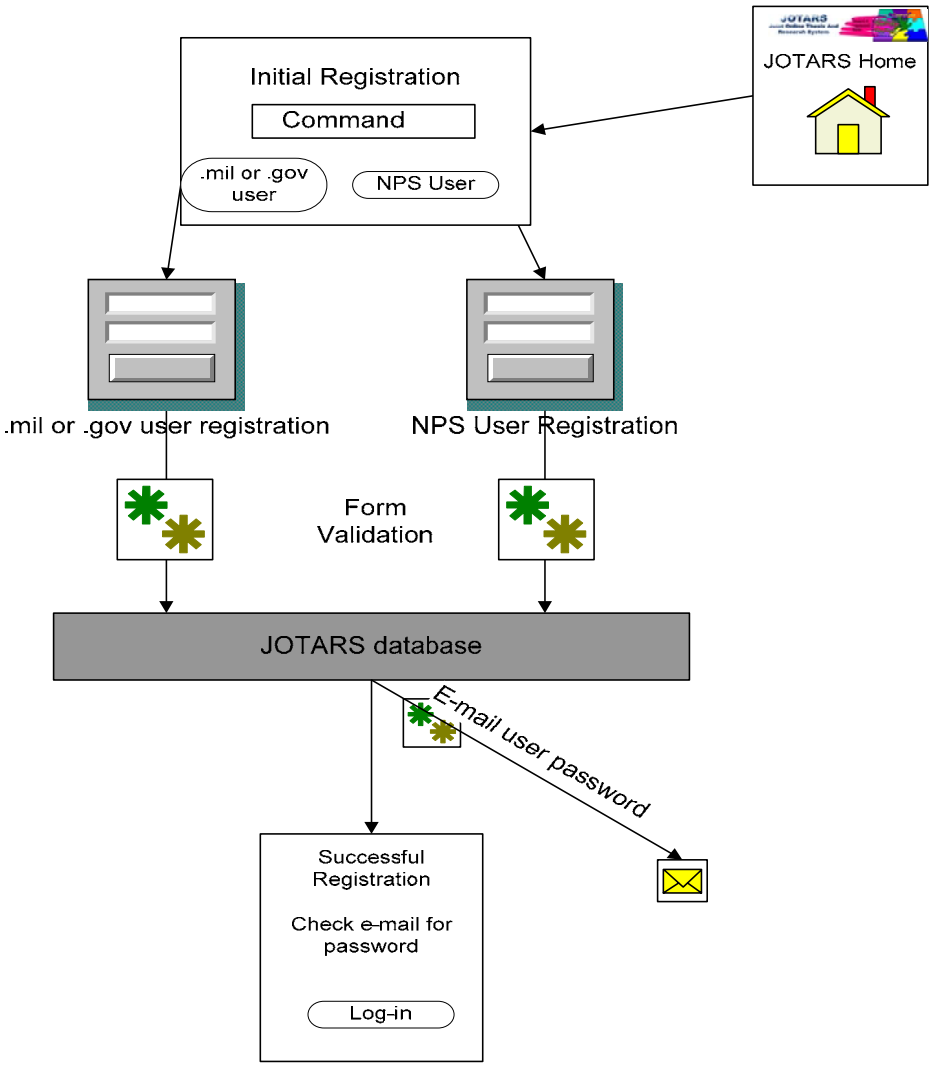

Figure 11. User Registration Process

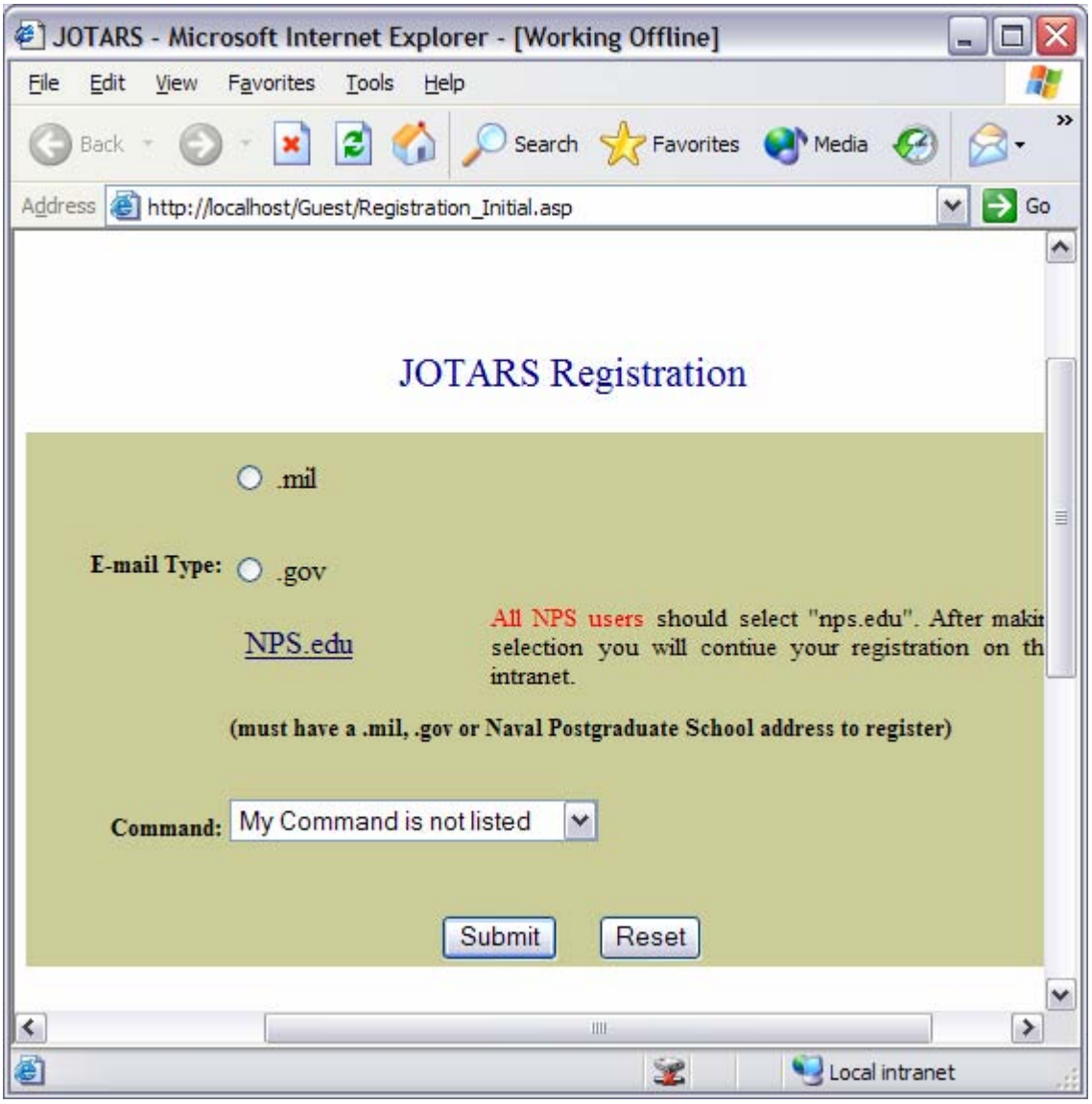

Figure 12. User Registration Step One Screen Shot

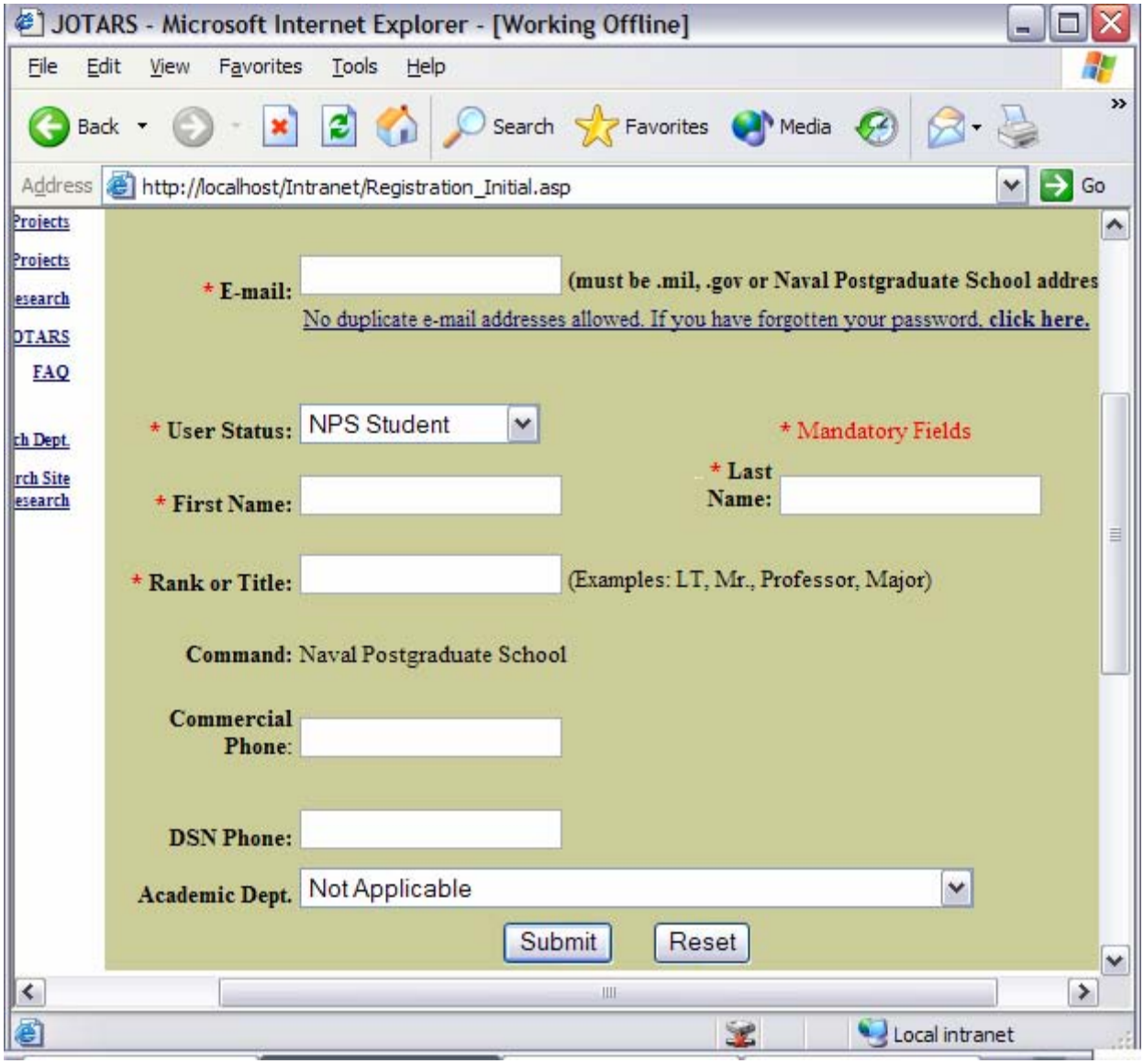

Figure 13. User Registration Step Two Screen Shot

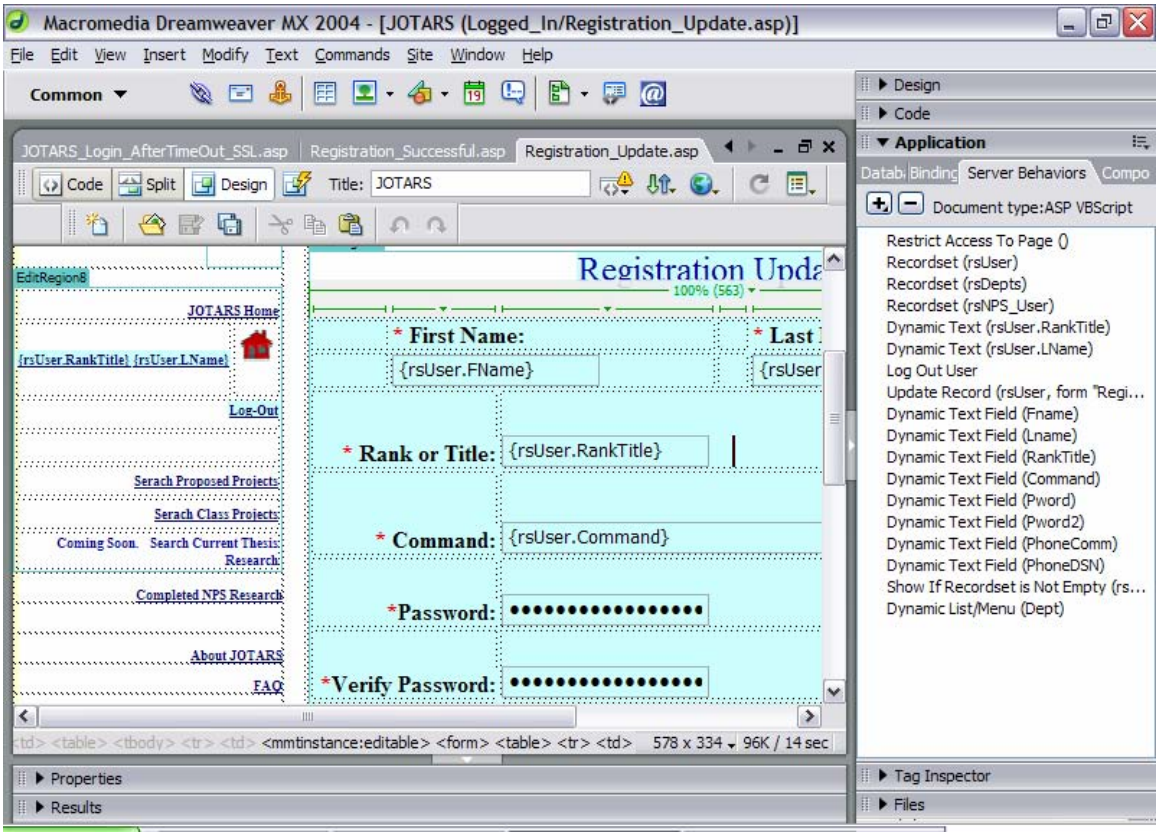

Figure 14. User Registration

D. LOG-IN

Upon a user's request, forgotten passwords will be sent to nps.edu, .mil or .gov e-mail addresses. Figure 15 illustrates the flow. The Log-in function is a standard server behavior in Dreamweaver which makes building this page very easy. A free extension from Dreamweaver Exchange, named https enforcer, was used to force log-in over a Secure Socket Layer (SSL) connection. A Log-out feature was also provided to authenticated users. Figures 16 and 17 are screen shots of log-in and log-in error pages. In addition, whenever there is a session time-out, users are automatically directed to a fresh log-in page which is displayed in Figure 18.

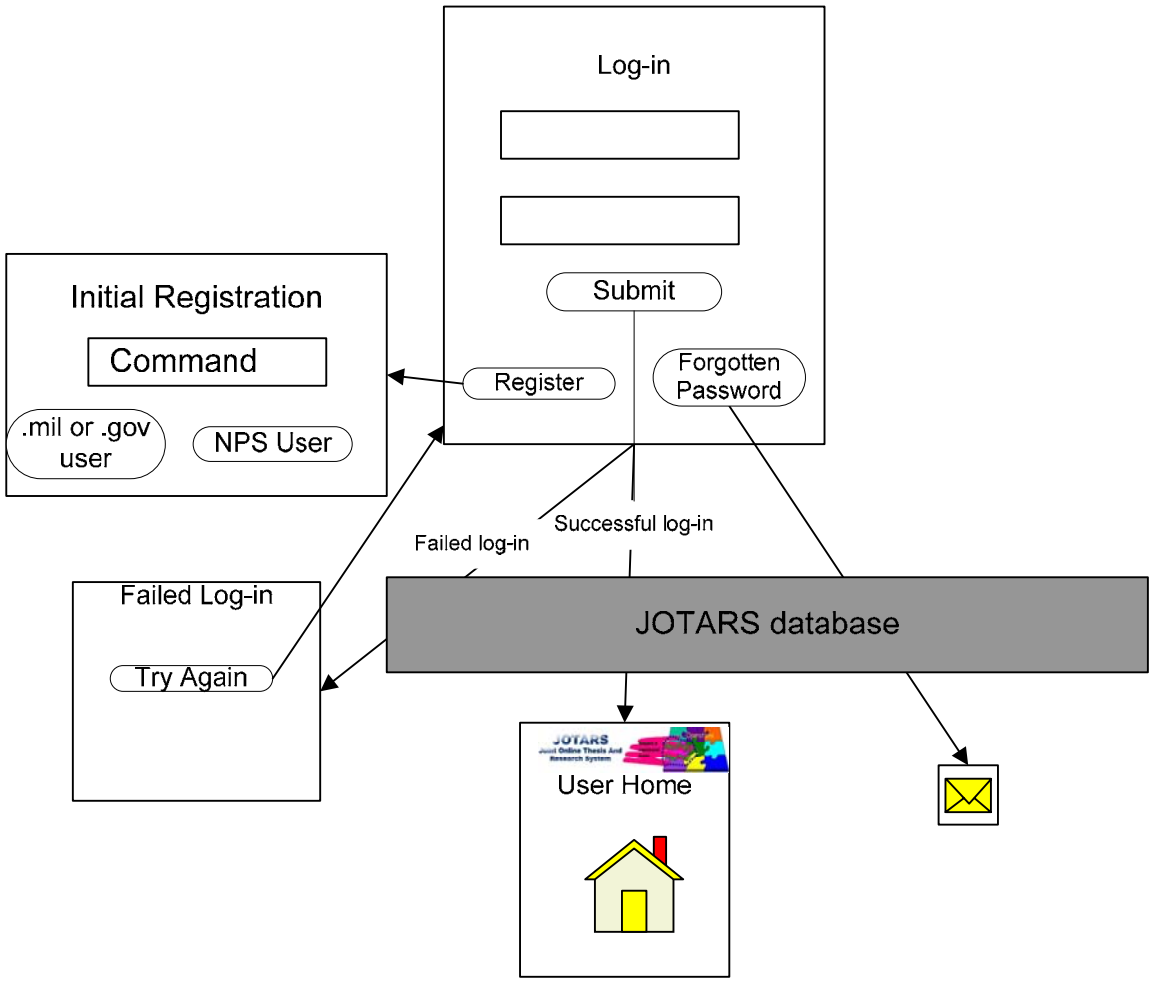

Figure 15. Log-in Process

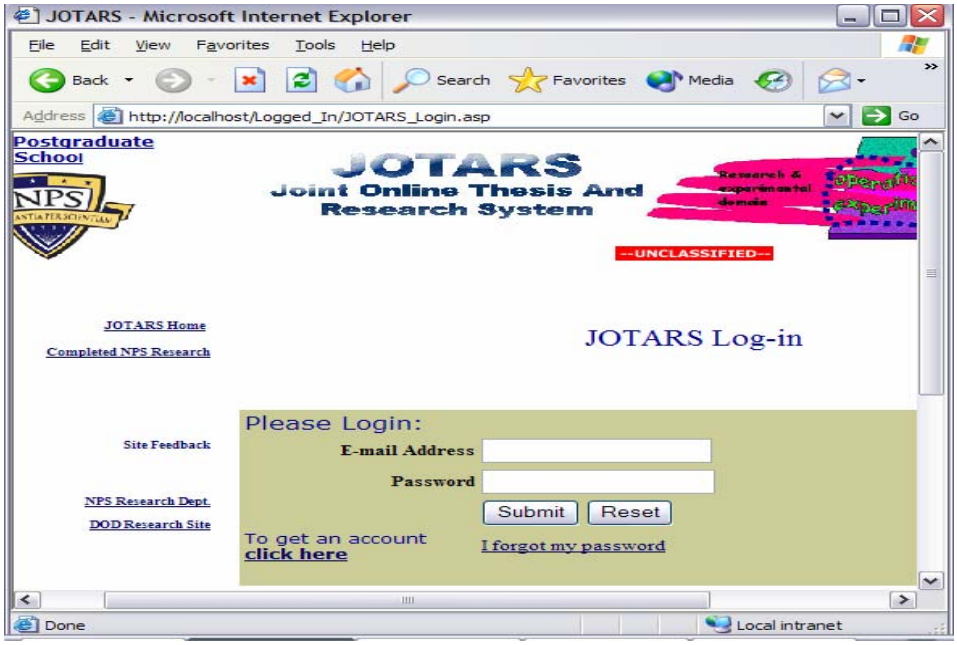

Figure 16. Log-in Screen Shot

Figure 17. Log-in Error Screen Shot

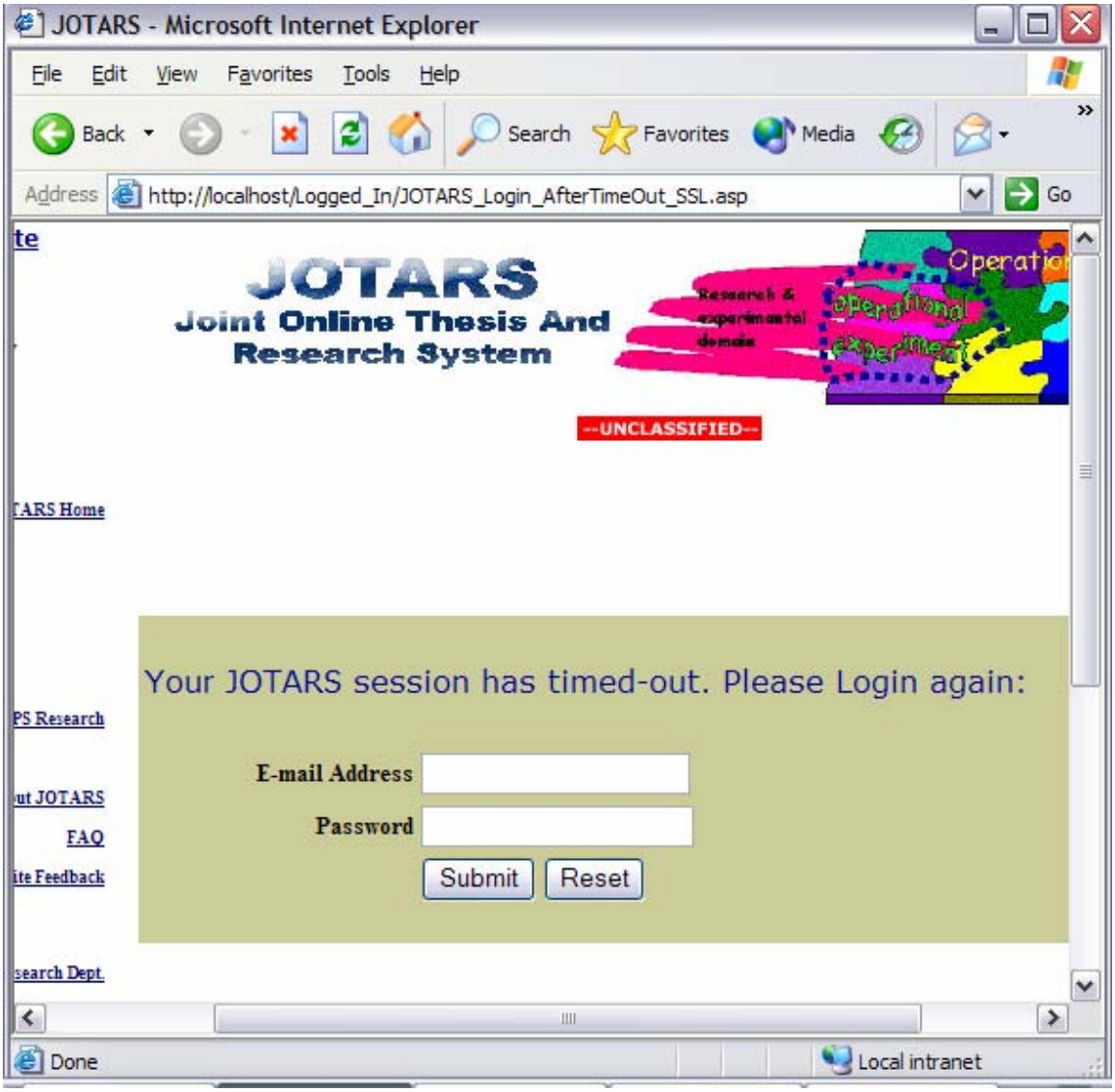

Figure 18. Log-in After Time-Out Screen Shot

E. THESIS PROJECTS

Figure 19 illustrates the flow process of searching and associating with proposed projects. Figure 20 is a screen shot of the Advanced Search page. Building the search results page required the greatest amount of hand coding. Tutorials were used to bold search terms on the results page. The record set help function within Dreamweaver and numerous Google searches were used to build the record set, shown in Figure 21 for the advanced search results page.

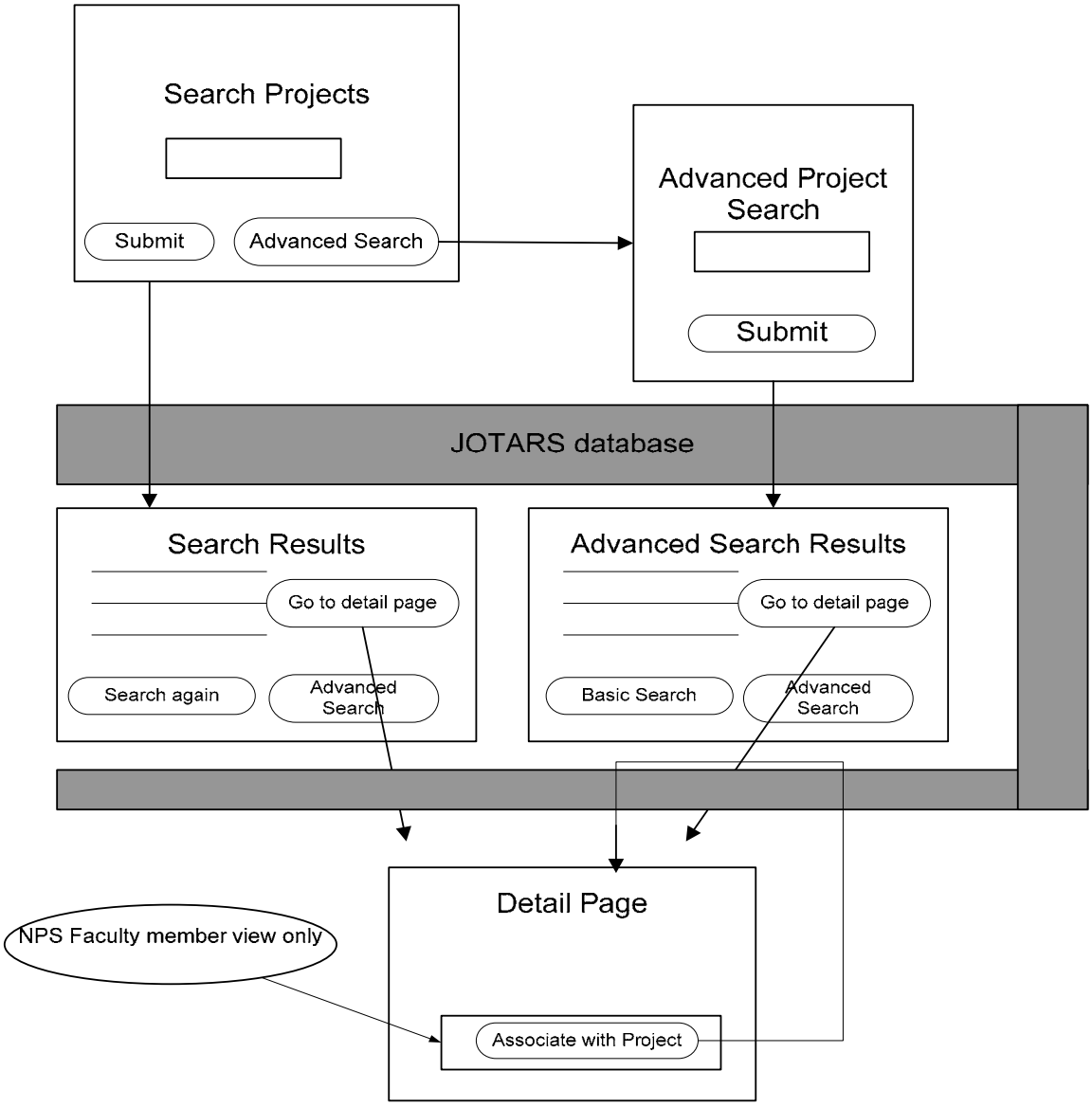

Figure 19. Proposed Projects

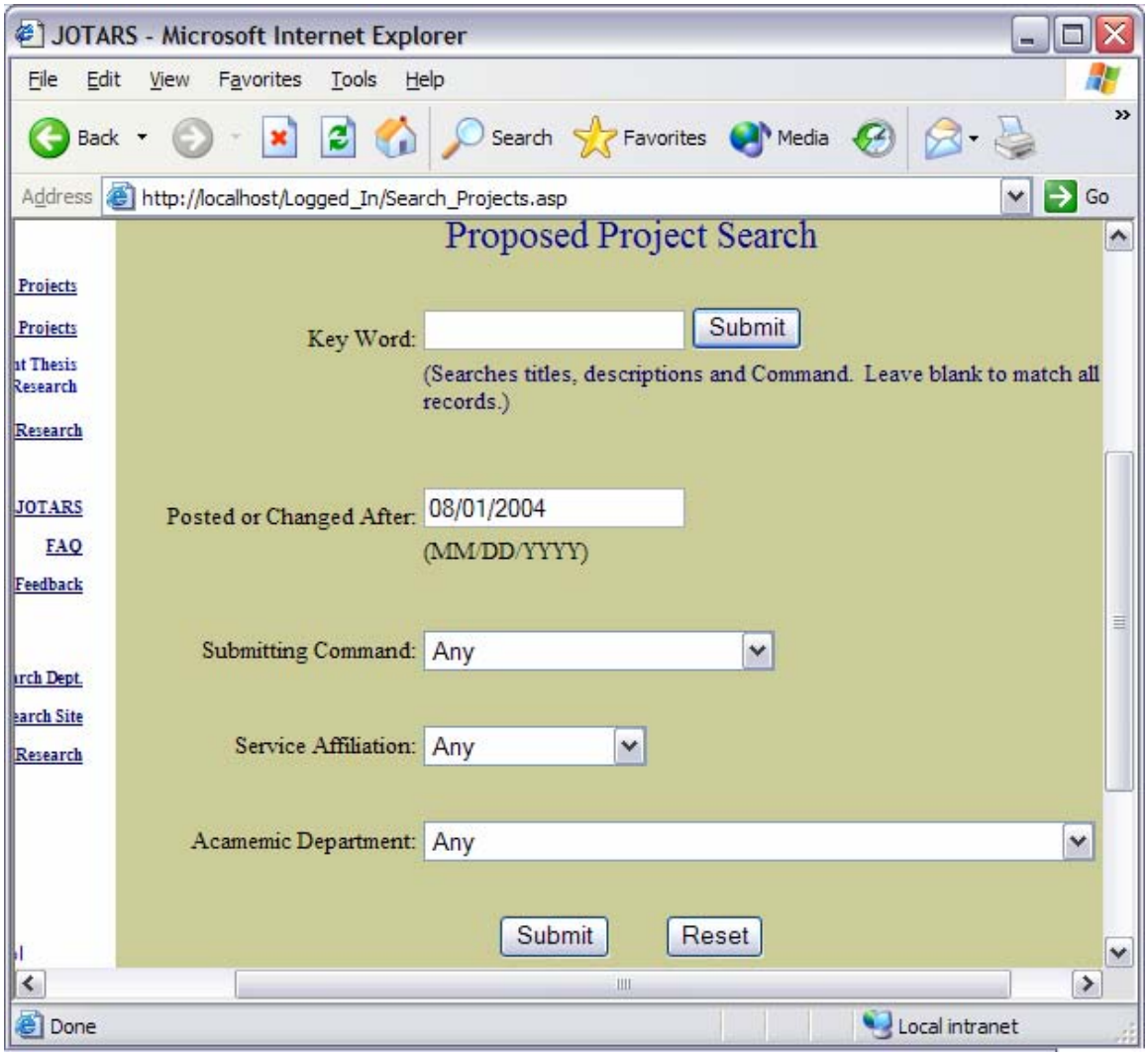

Figure 20. Advanced Search Page for Thesis Projects

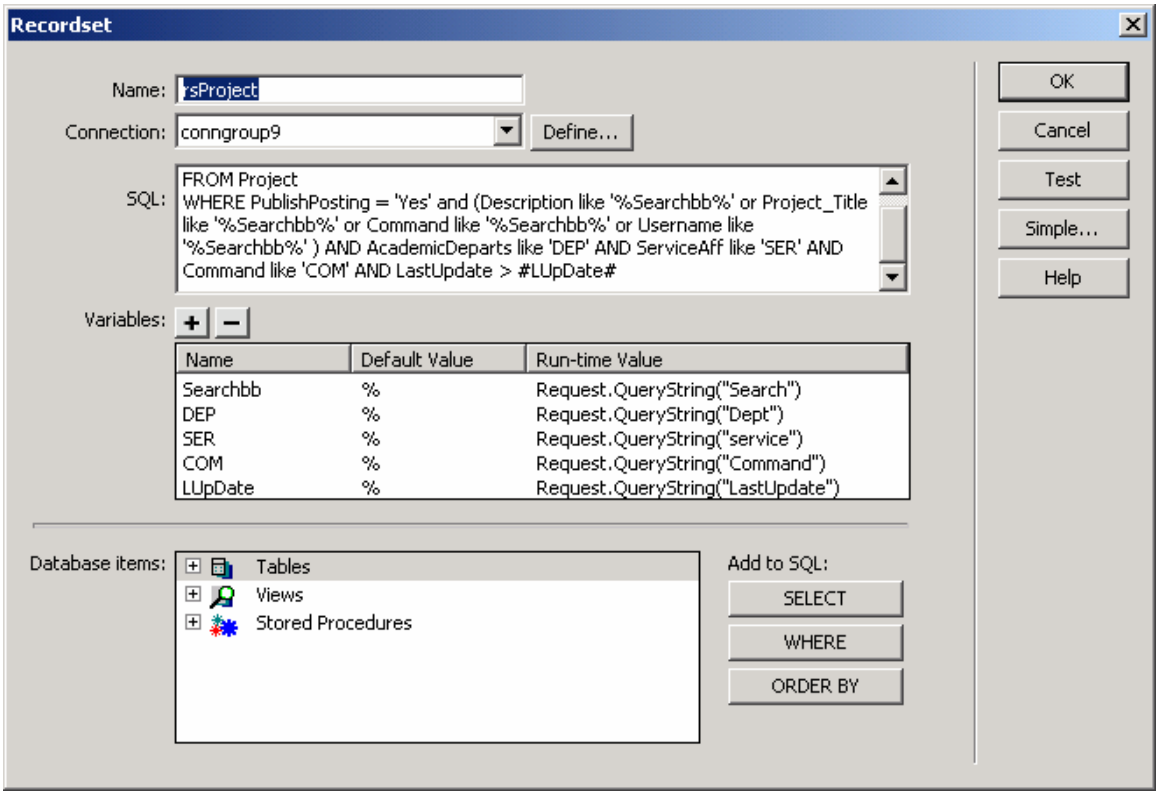

Figure 21. Record set for project advanced search results

When the outcome of a search returns no results, tips are provided to help refine the search as shown in Figure 22 below.

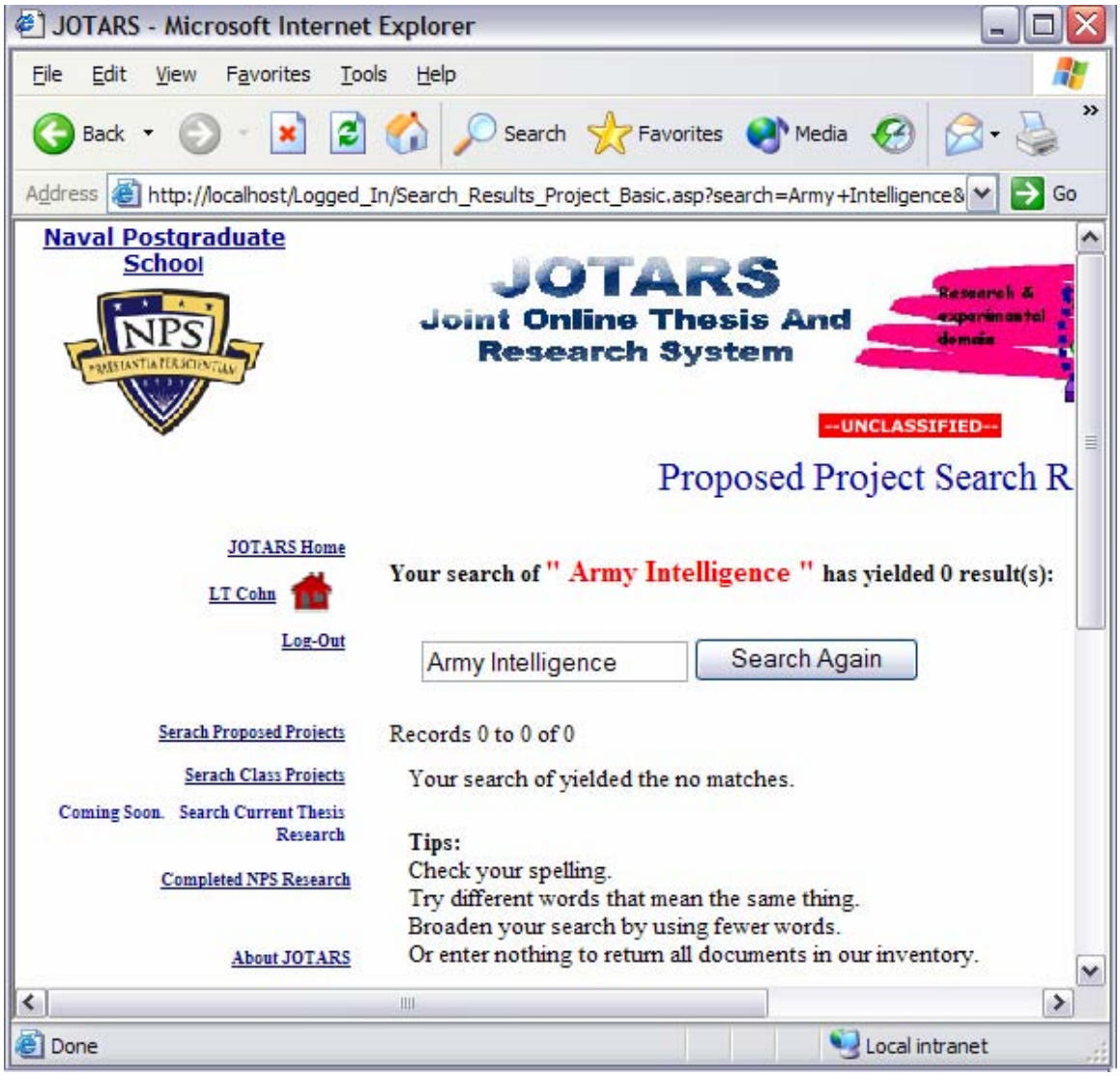

Figure 22. No Results Screen Shot

When the outcome of a search is successful, the list of results is displayed as shown in Figure 23 below. Users can then drill down to the detail pages if more information is desired.

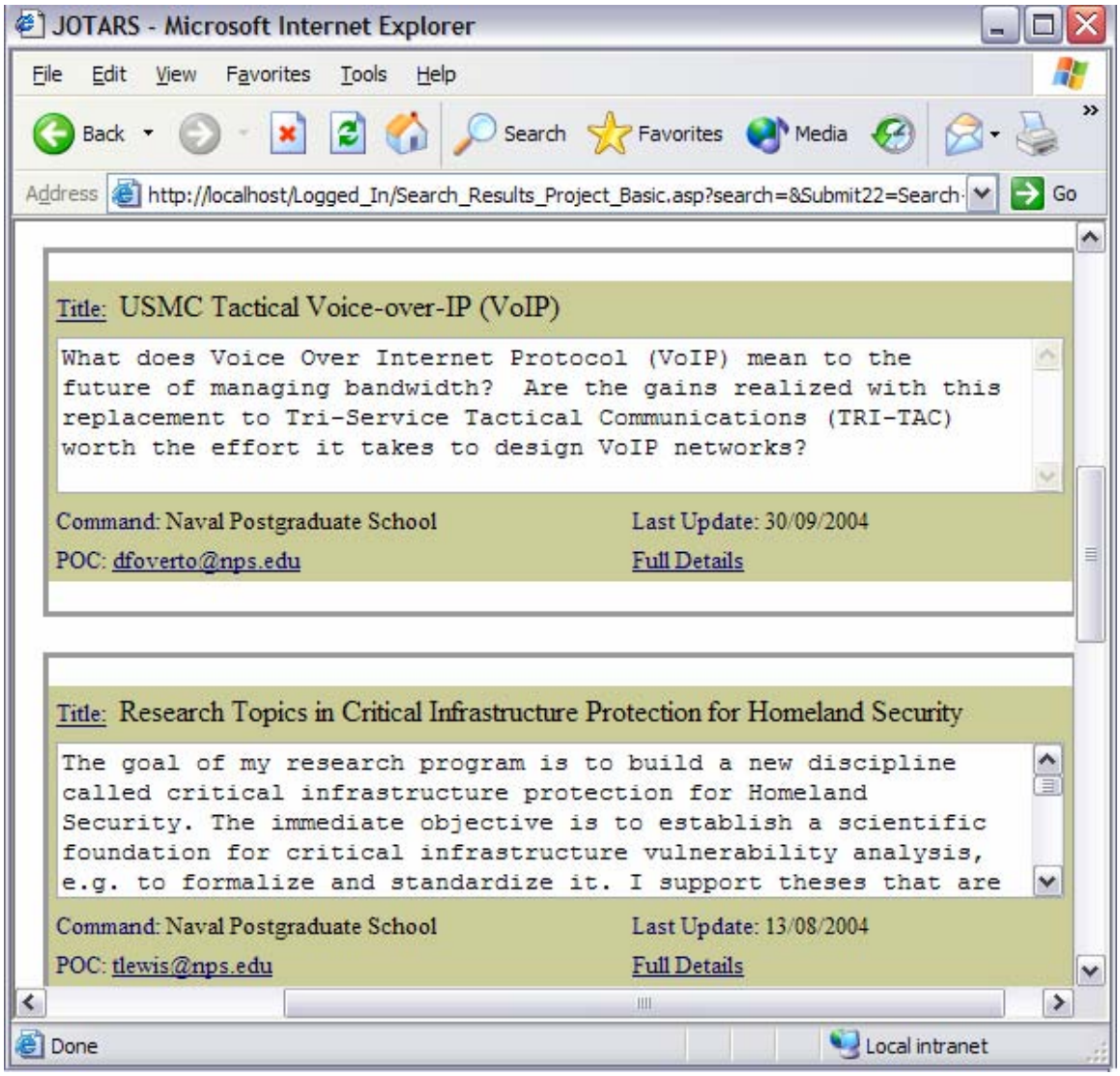

Figure 23. Thesis Project Search Results

The detail pages provide point of contact information for students to follow-up or contact a project's sponsor. NPS Professors have the option to associate themselves as a potential Thesis Advisor for projects as shown below in Figure 24.

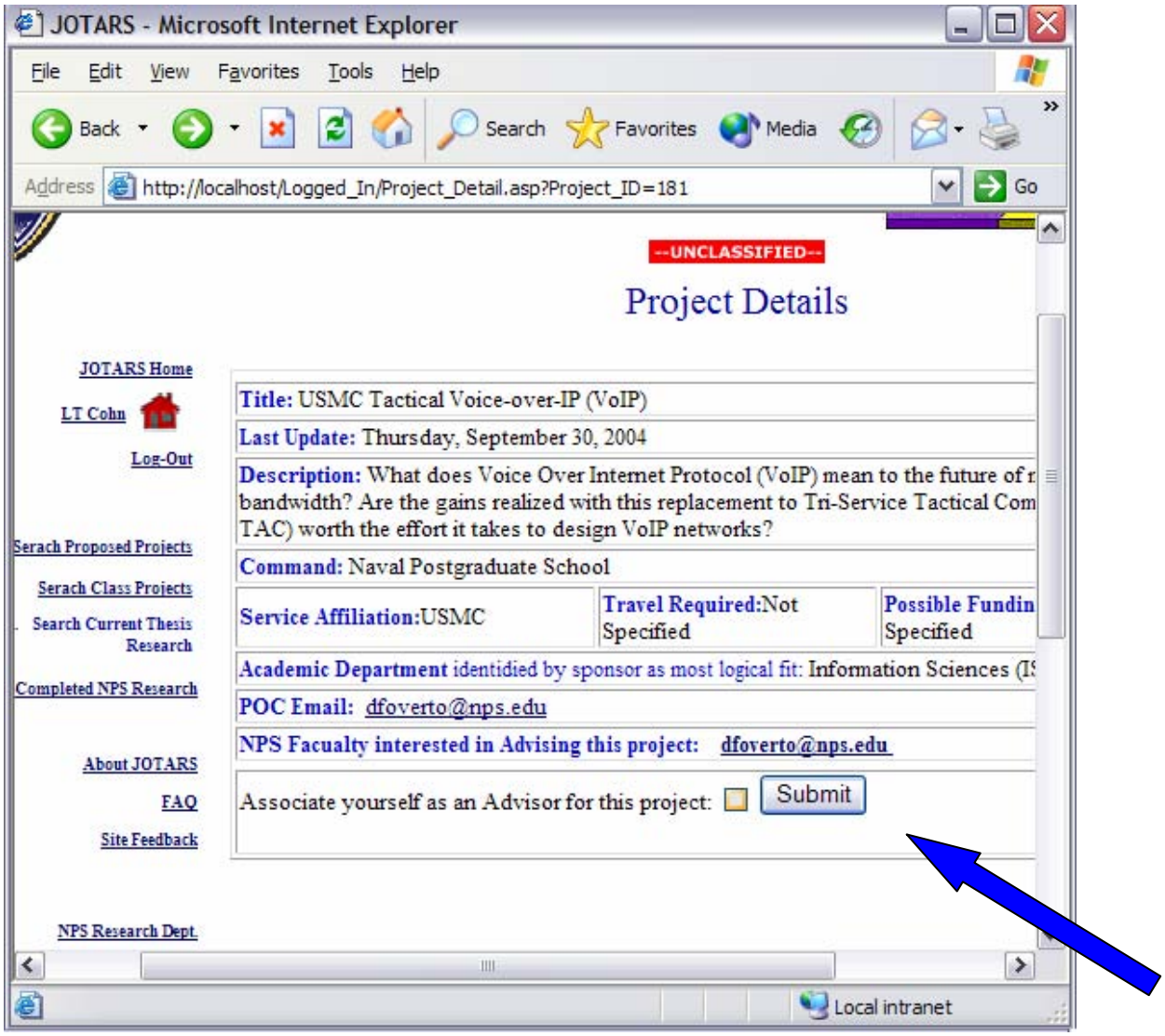

Figure 24. Project Detail Page Screen Shot

Once an NPS Professor is associated as a potential Thesis Advisor, the detail page displays an option to remove their name as shown in Figure 25.

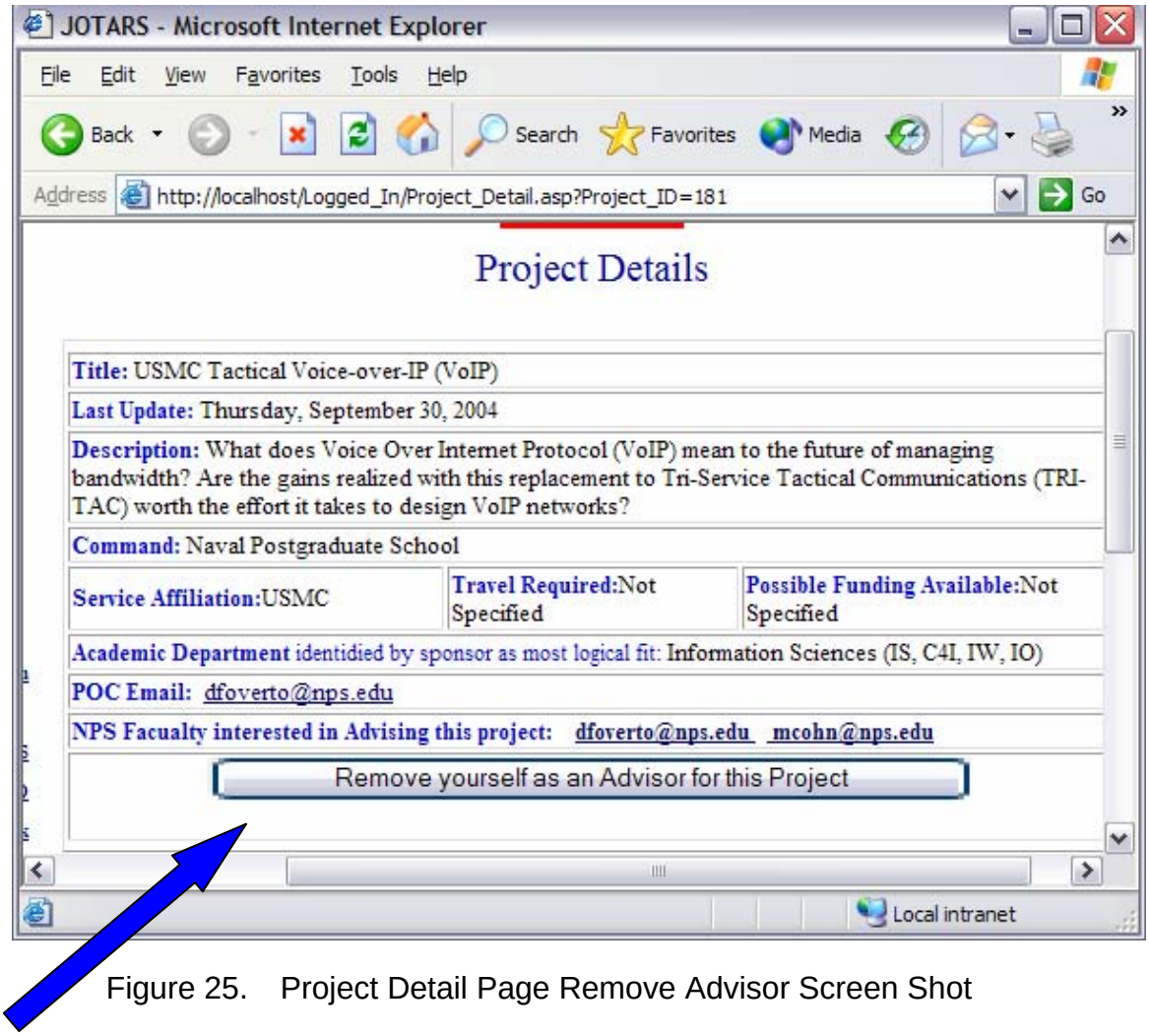

Figure 25. Project Detail Page Remove Advisor Screen Shot

Figures 26 and 27 are screen shots of a new project input form. It is important to not allow a spoof entry or entering a project with someone else's name. The user must be logged-in so there is no need to request input of their e-mail address. The input of the user name is done by using a "hidden field". Additionally, the date is created by the database when a new record is created.

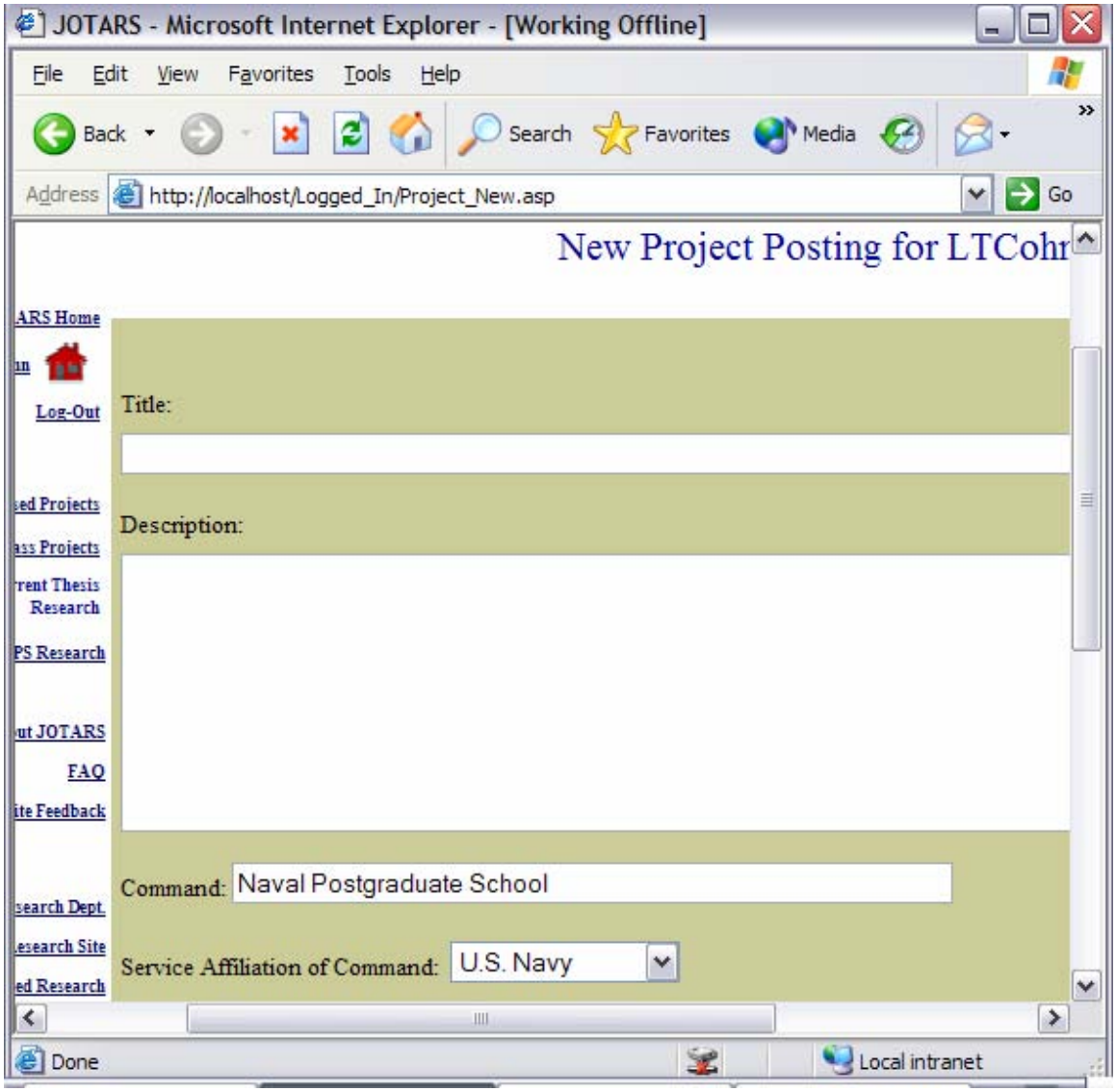

Figure 26. New Project Input Form

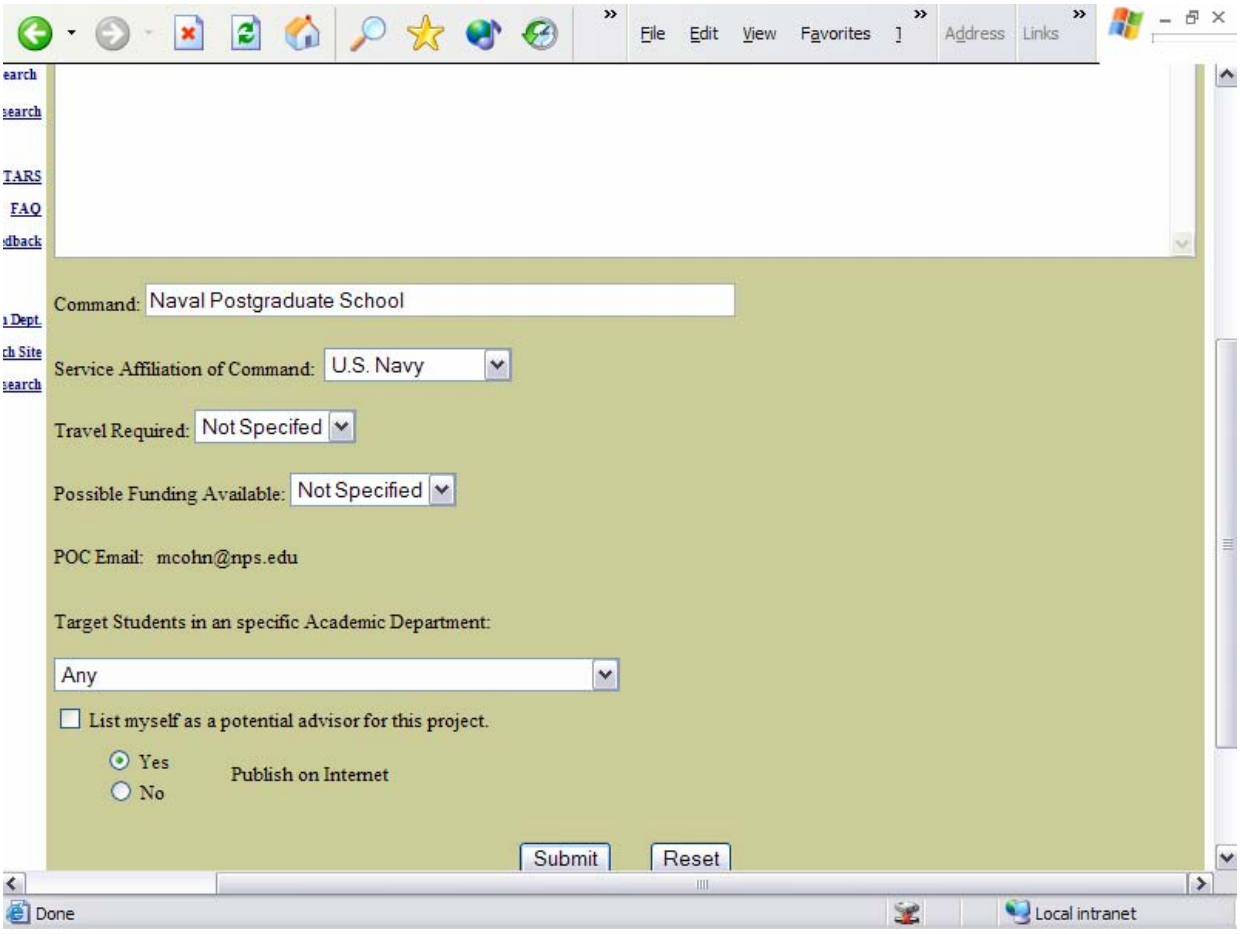

Figure 27. New Project Input Form Continued

JOTARS also allows users to modify or remove their postings. Figure 28 is a screen shot of a modification page. The remove posting link takes one to a feedback page as seen in Figure 29. This forces feedback when postings are removed. In fact, a form validation function will not allow the posting to be removed unless feedback is provided. Figure 29 is a form validation error message. The feedback is an important capability because it allows for quantitative analysis which the school could use to demonstrate its outreach to DOD organizations. Areas for improvement could also be identified. Neither Projects nor Class Projects are deleted from the database rather they are just not viewable.

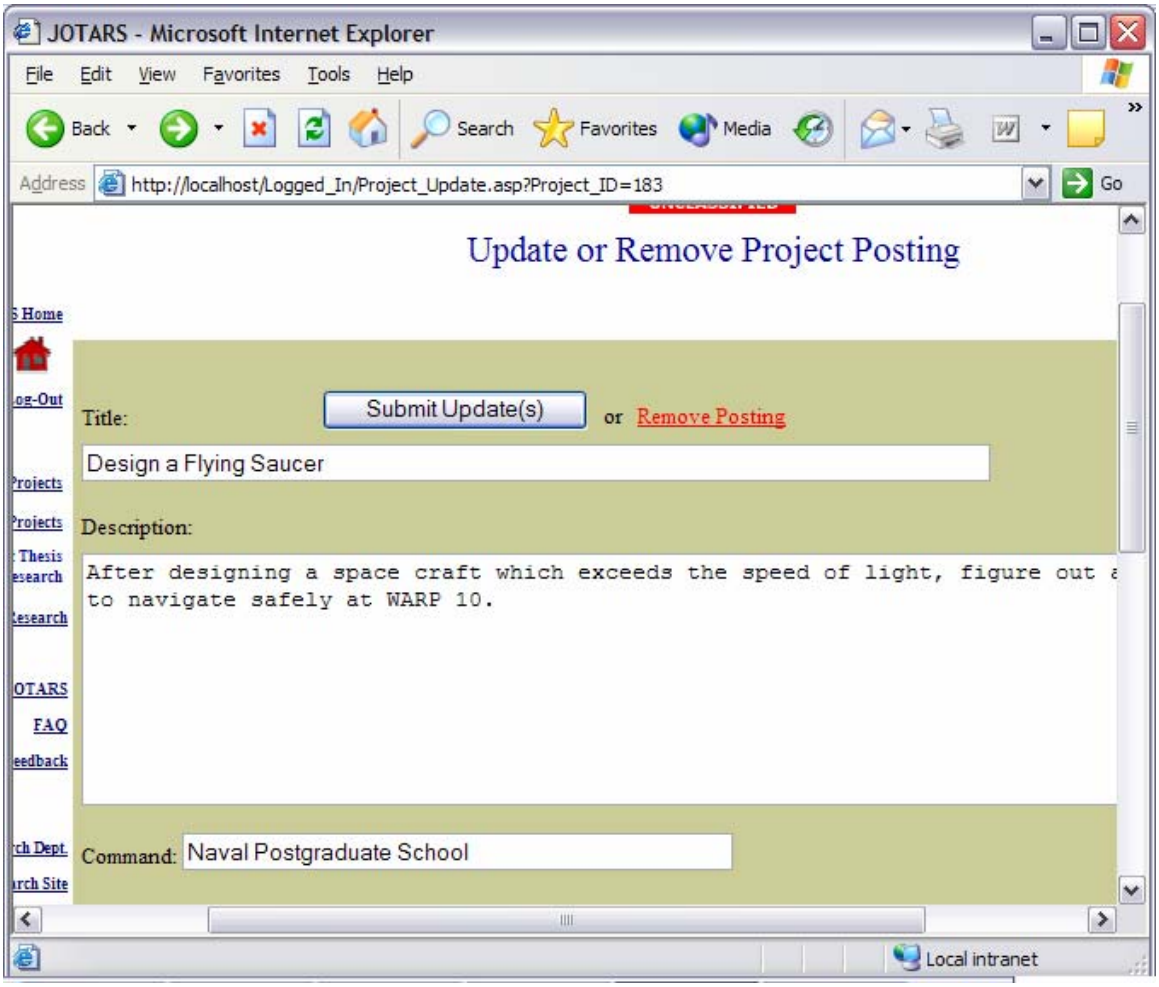

Figure 28. Project Update Screen Shot

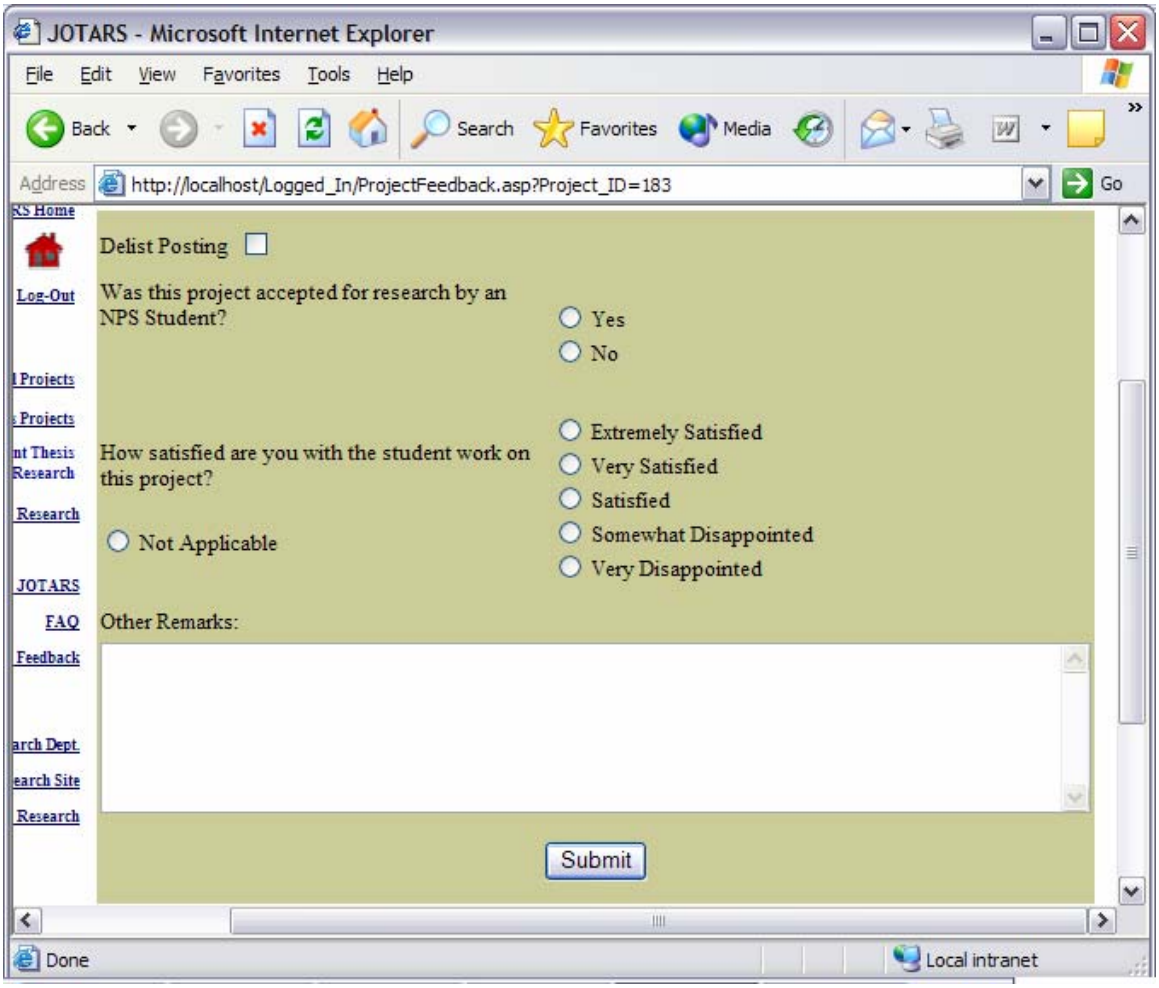

Figure 29. Remove Project Posting and Feedback Screen Shot

Figure 30. Form Validation Error Message

F. CLASS PROJECTS

The class project flow shown in Figure 8[31?] is similar to that of proposed thesis projects.

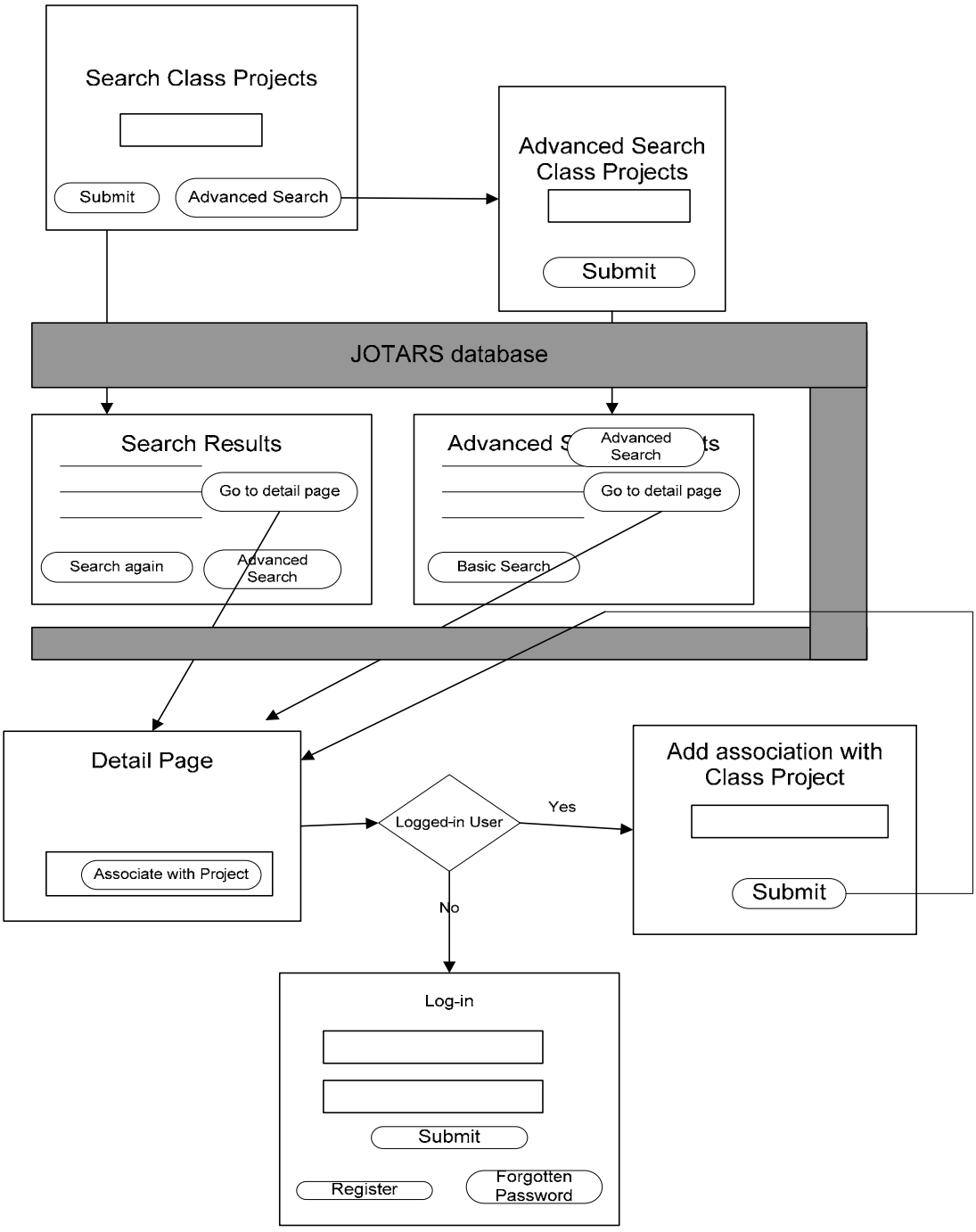

Figure 31. Class Projects

The advanced search function also is similar to the Thesis Project search. Search options include quarter offered, academic department or posted after date. Figure 32 below is a screen shot of the advanced Class Projects Search page. .

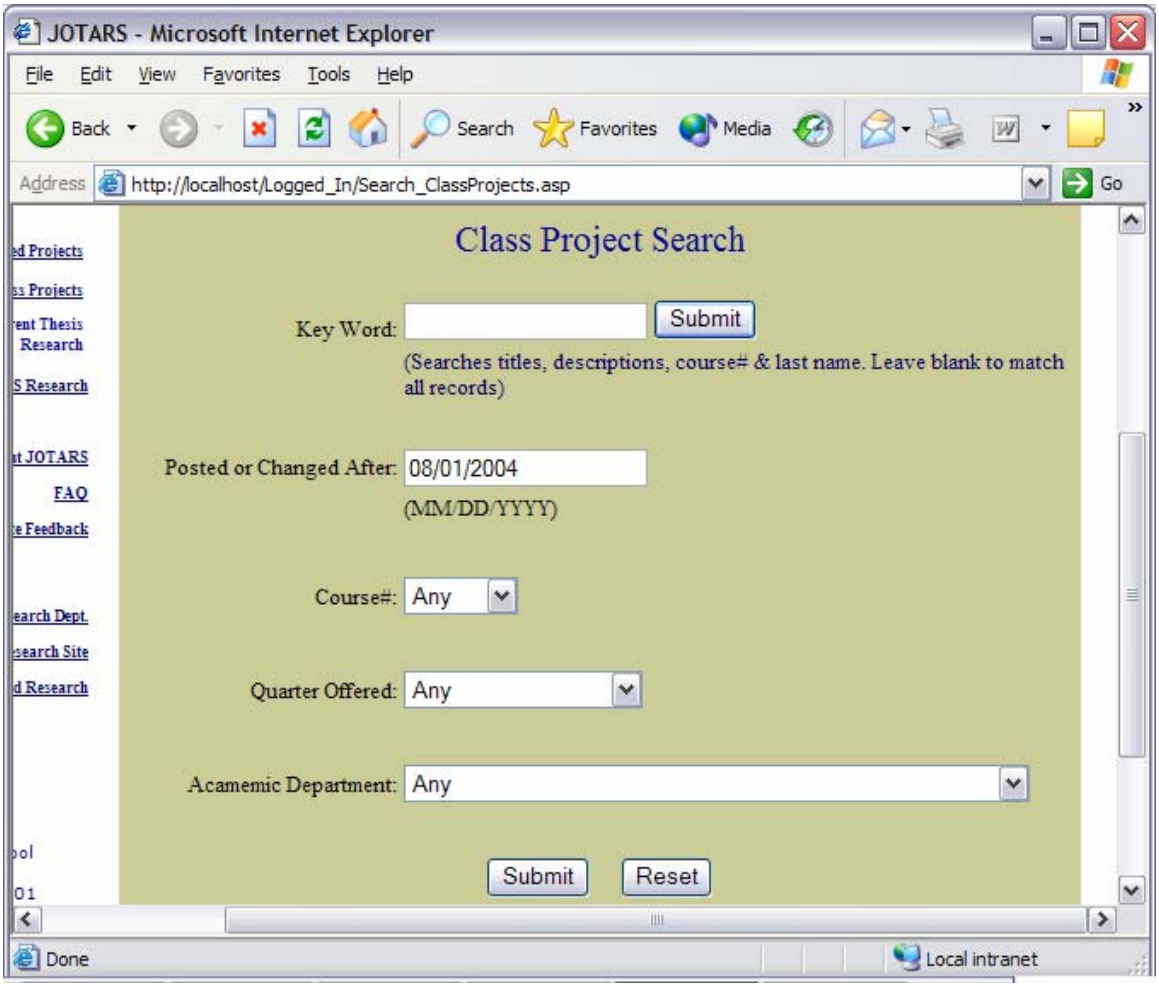

Figure 32. Advanced Class Project Search Screen Shot

The results of a successful search are displayed as shown in Figure 33. Figures 34 and 35 are screen shots of a New Class Project input form. Users are also able to edit their and only their postings.

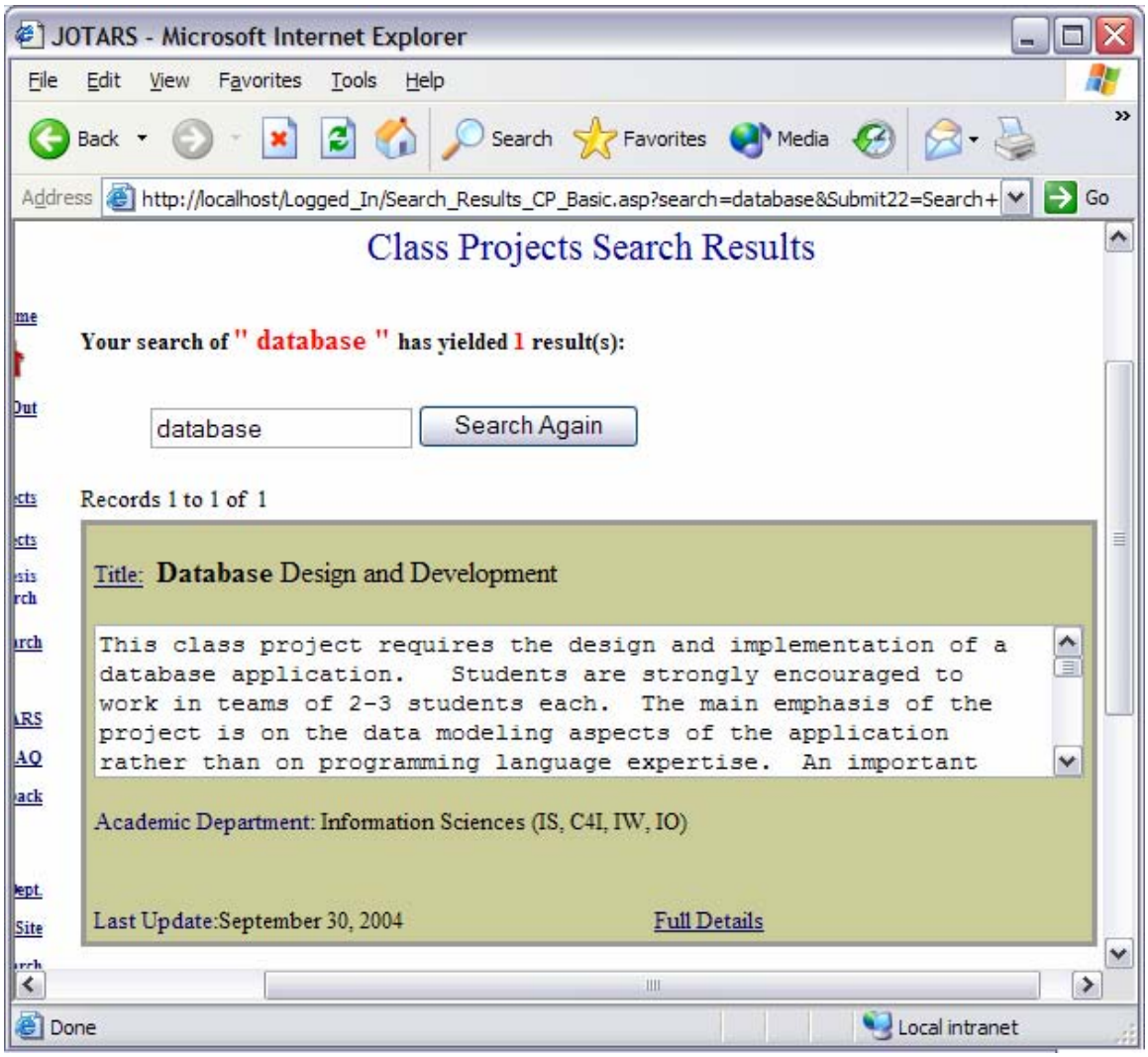

Figure 33. Class Project Search Results Screen Shot

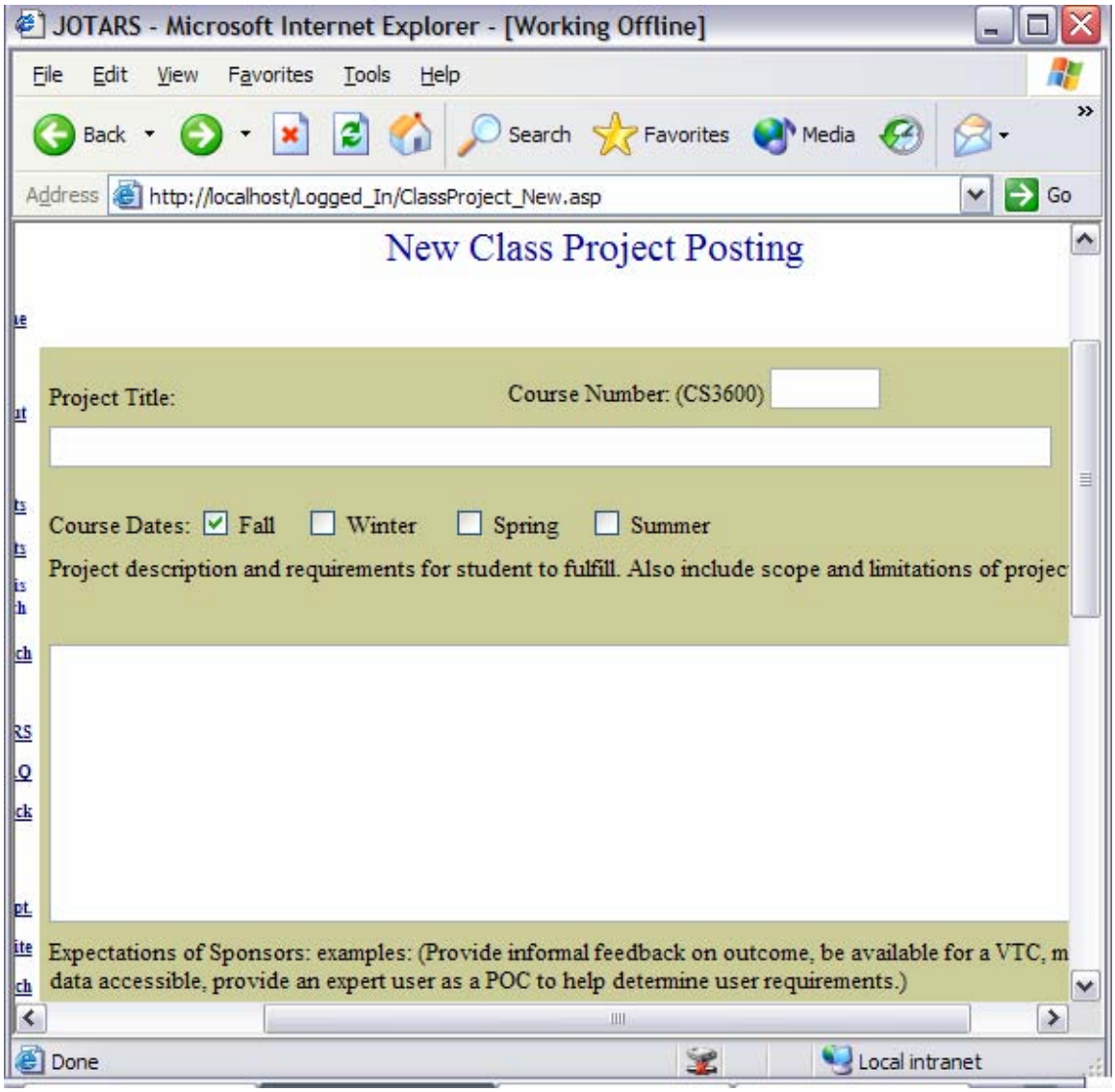

Figure 34. New Class Project Input Form Screen Shot

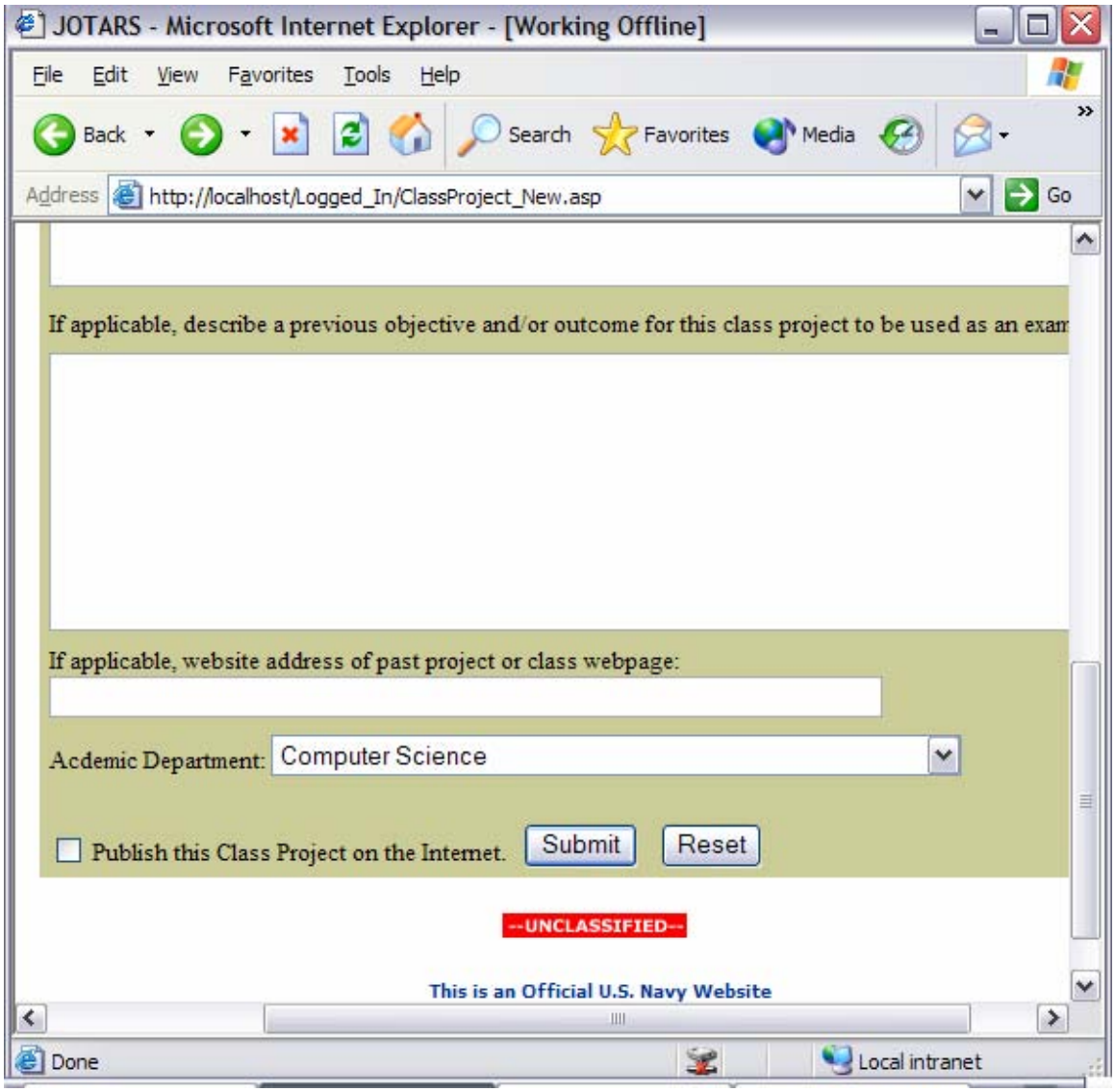

Figure 35. New Class Project Input Form Screen Shot Continued

The detail page for Class Projects provides useful information such as quarter(s) offered as shown in Figure 36. Users also have an opportunity to associate with a class project which is only viewable to NPS faculty and students. Figure 37 shows the user input area.

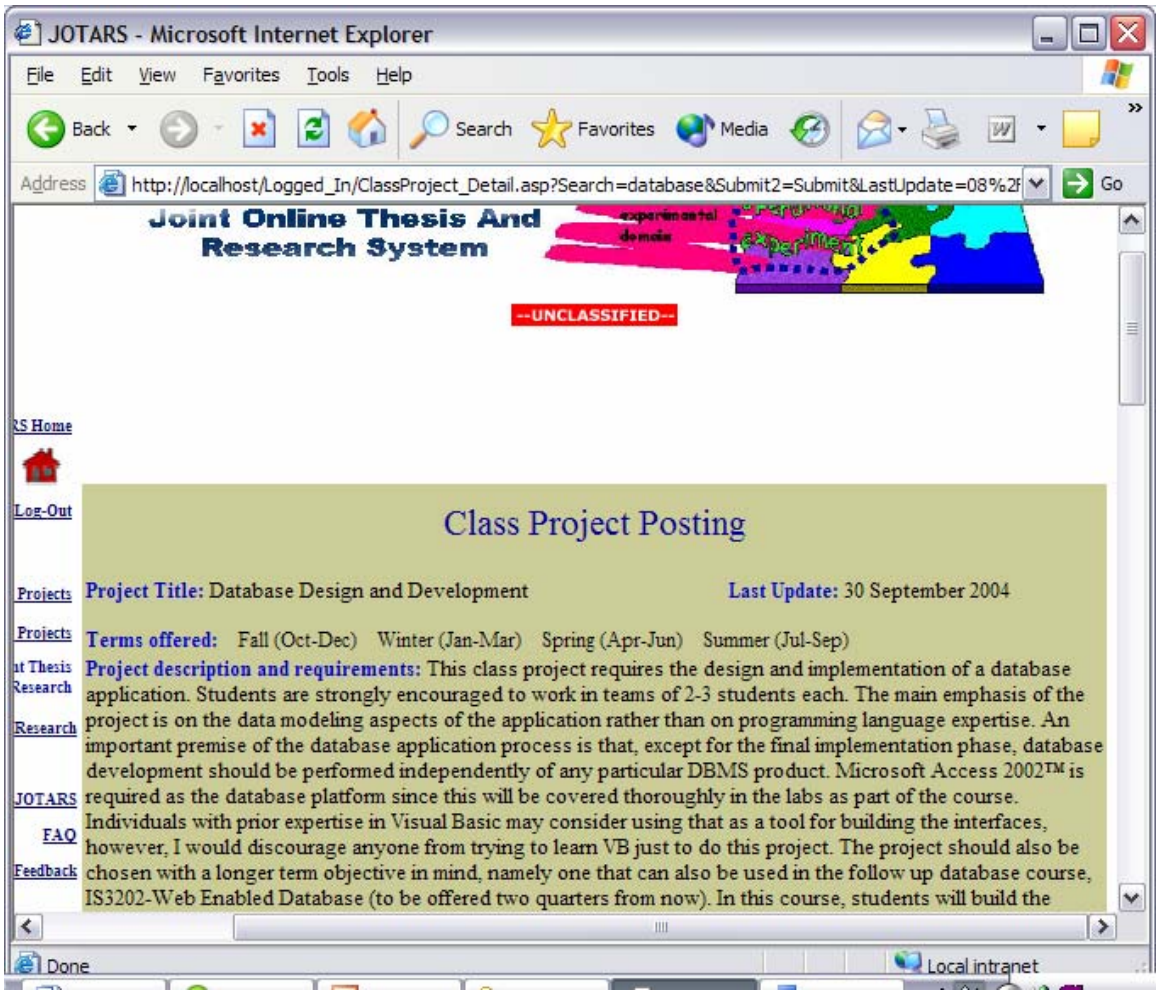

Figure 36. Class Project Detail Page Screen Shot

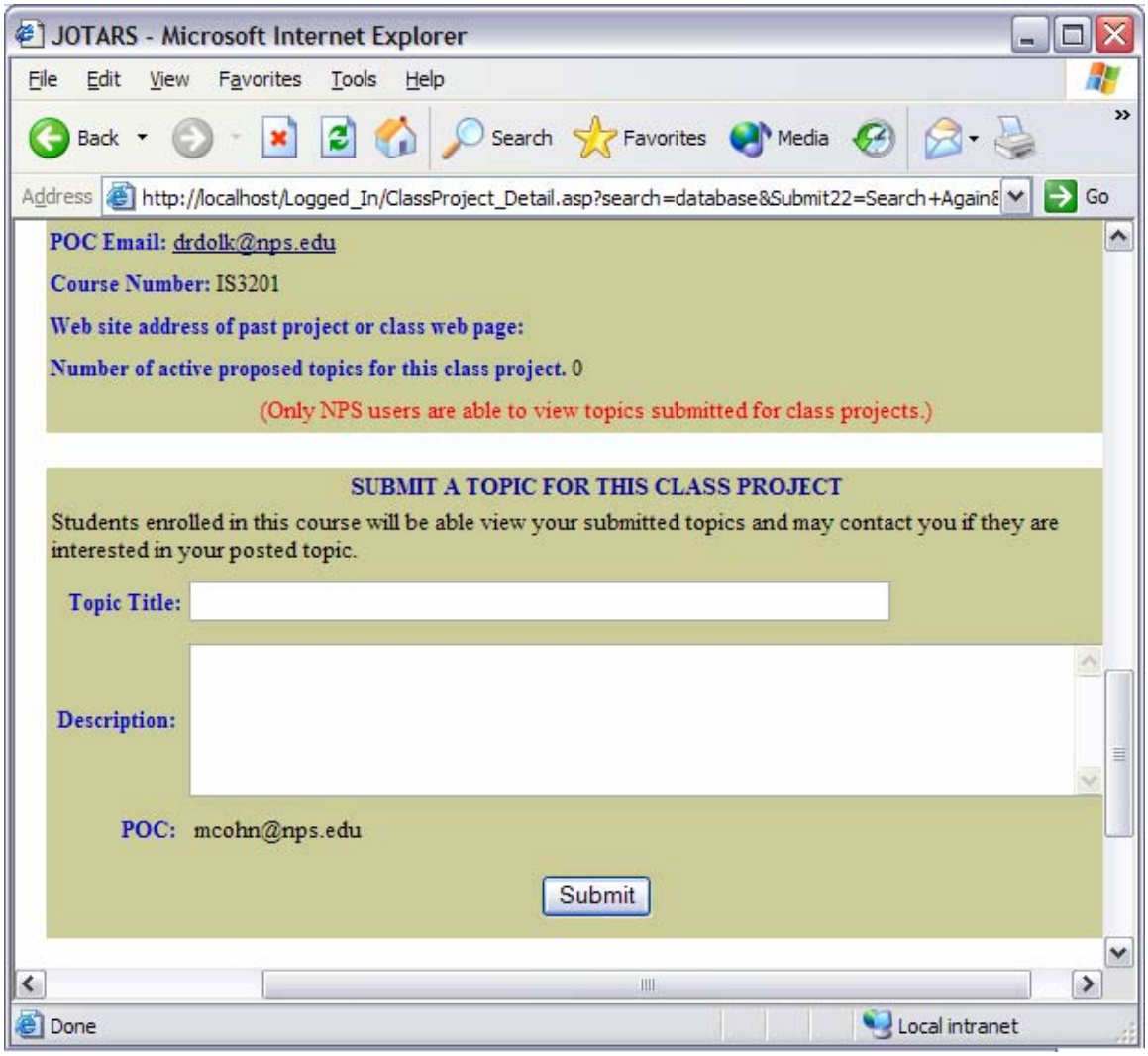

Figure 37. Class Project Detail Page Screen Shot Continued

Once a sponsor associates with a class project, students have an opportunity to view as shown in Figure 38.

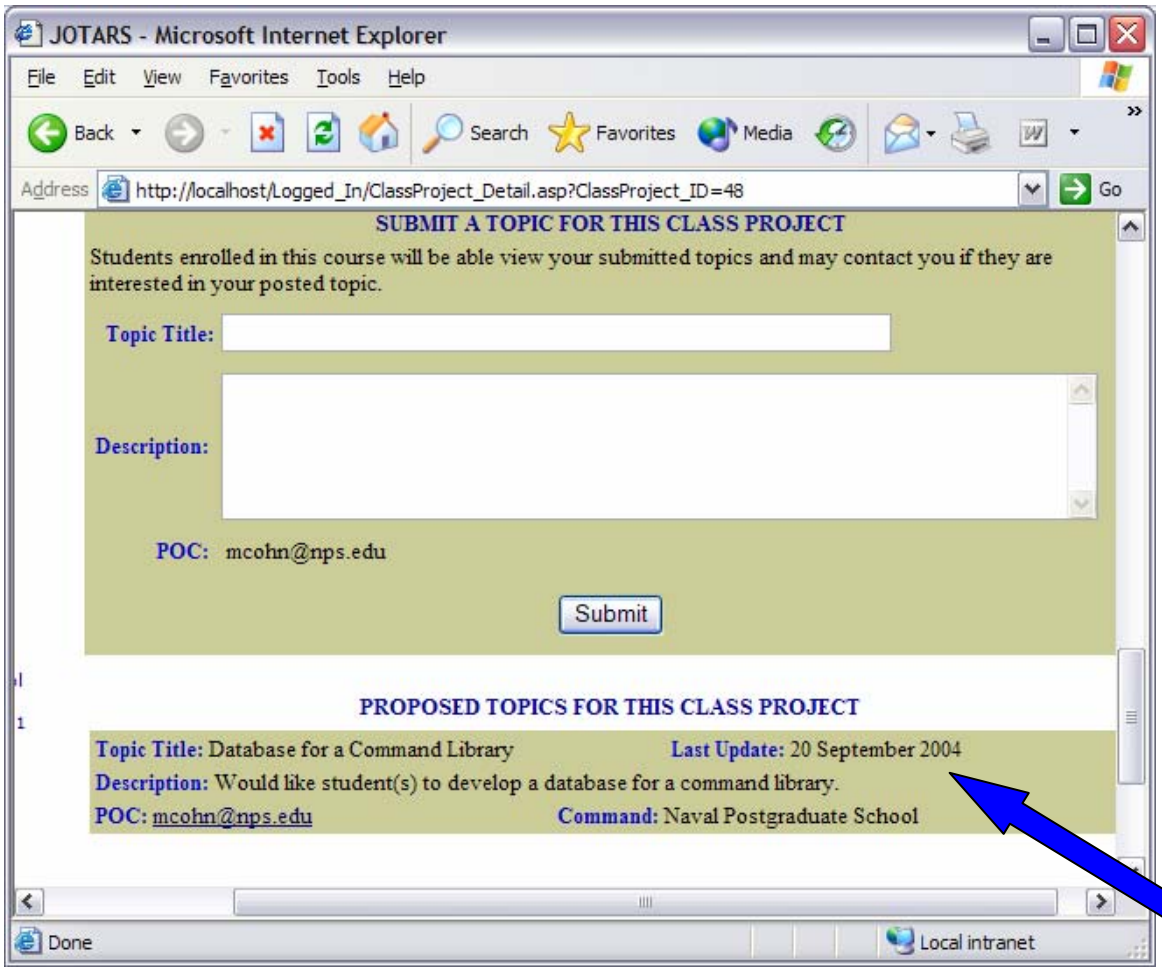

Figure 38. Class Project Detail Student View Screen Shot

A sponsor also has the ability to edit their association with a class project or remove the posting while providing feedback as shown in Figures 39 and 40.

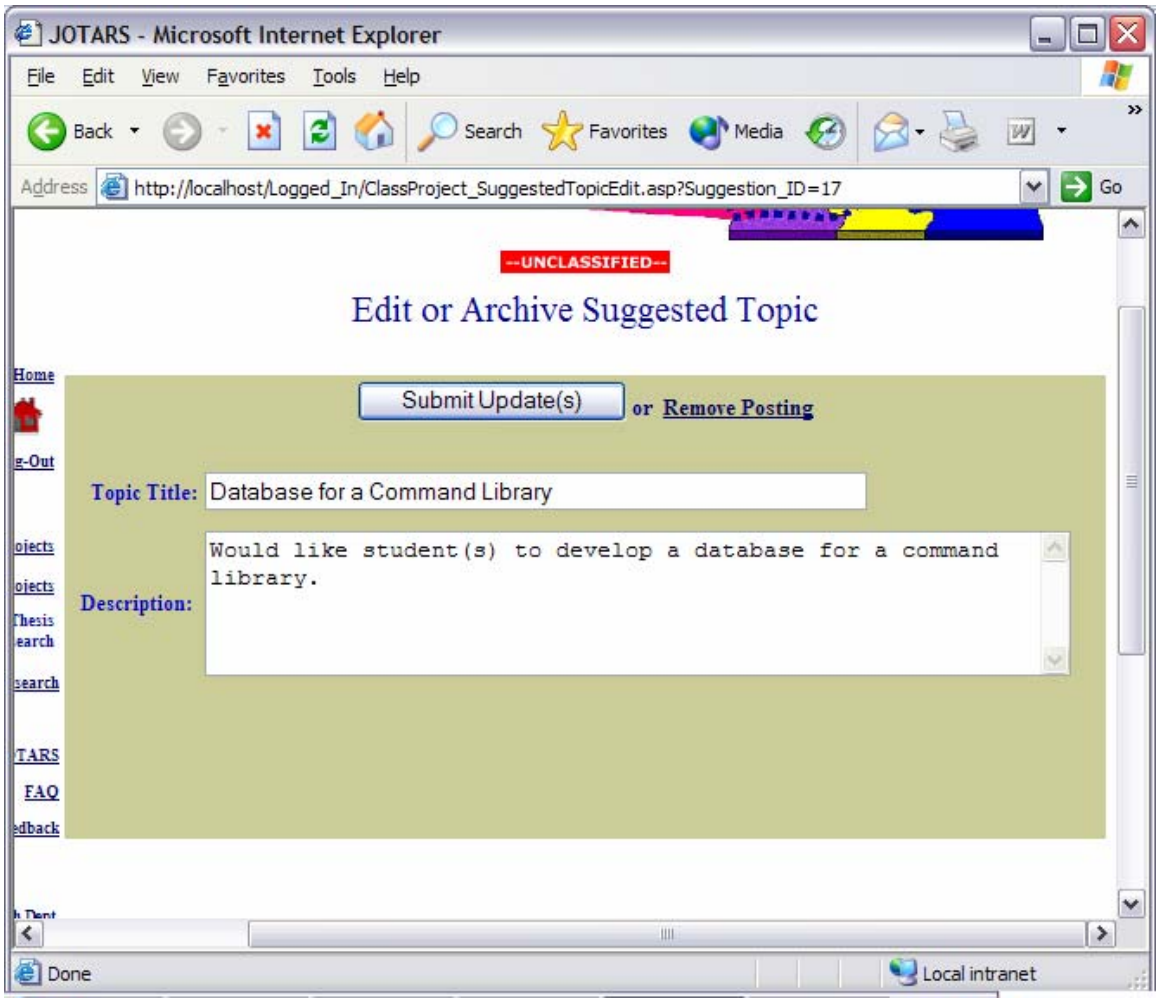

Figure 39. Edit Class Project Association Screen Shot

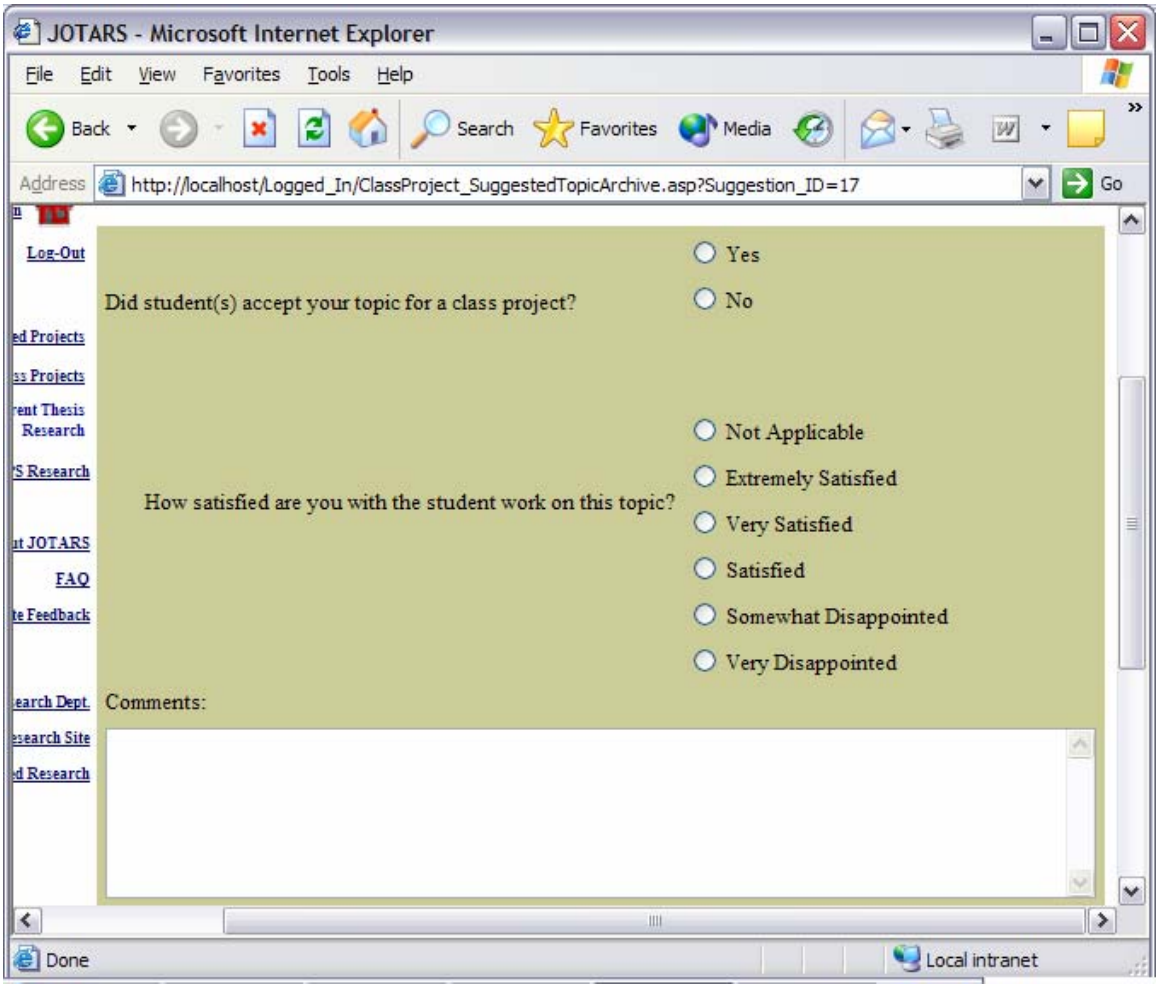

Figure 40. Remove Association with Class Project

G. FEEDBACK AND INFORMATION PAGES

Other miscellaneous pages and links were added to provide users with information about JOTARS and to offer an opportunity for users to provide general site feedback. Figures 41 and 42 show screen shots of Feedback and Frequently Asked Questions (FAQ) pages.

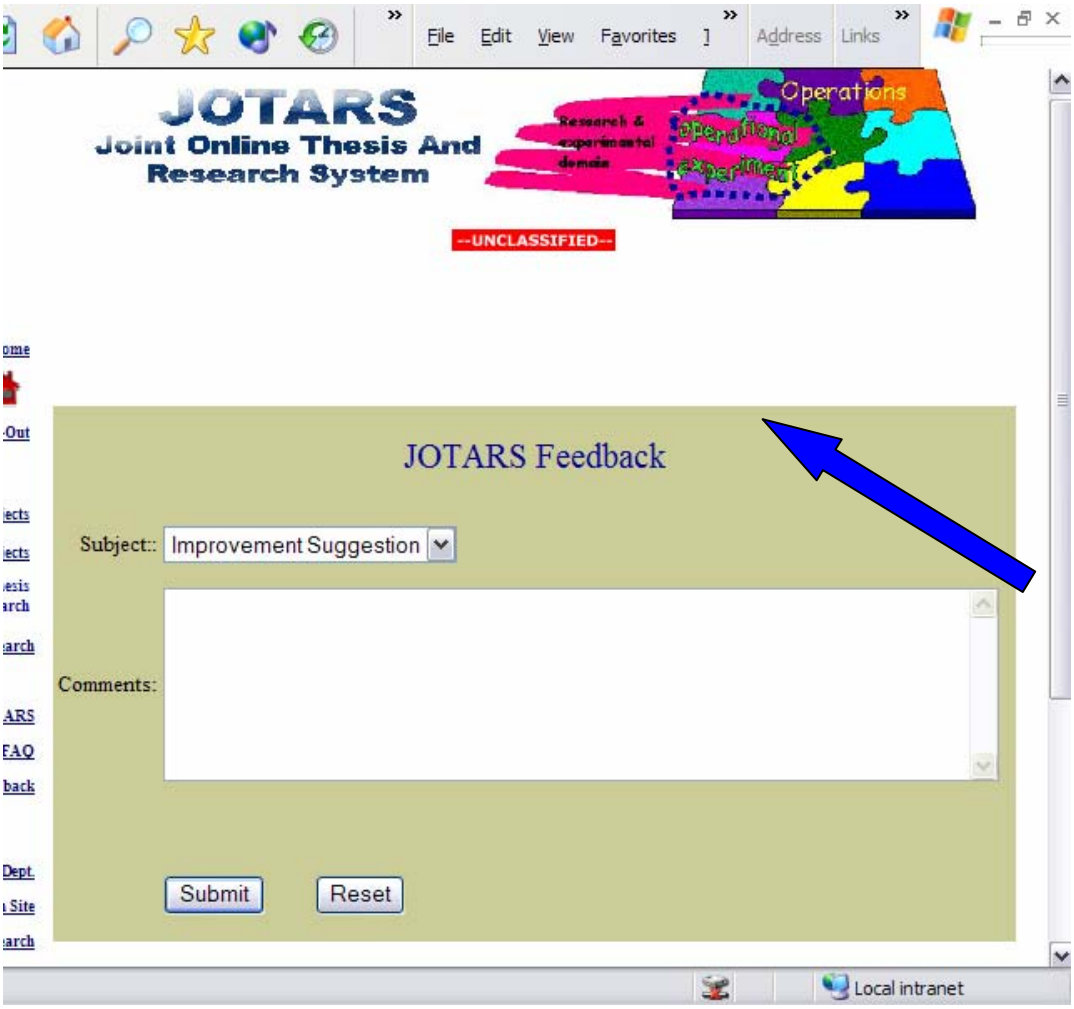

Figure 41. General Feedback Screen Shot

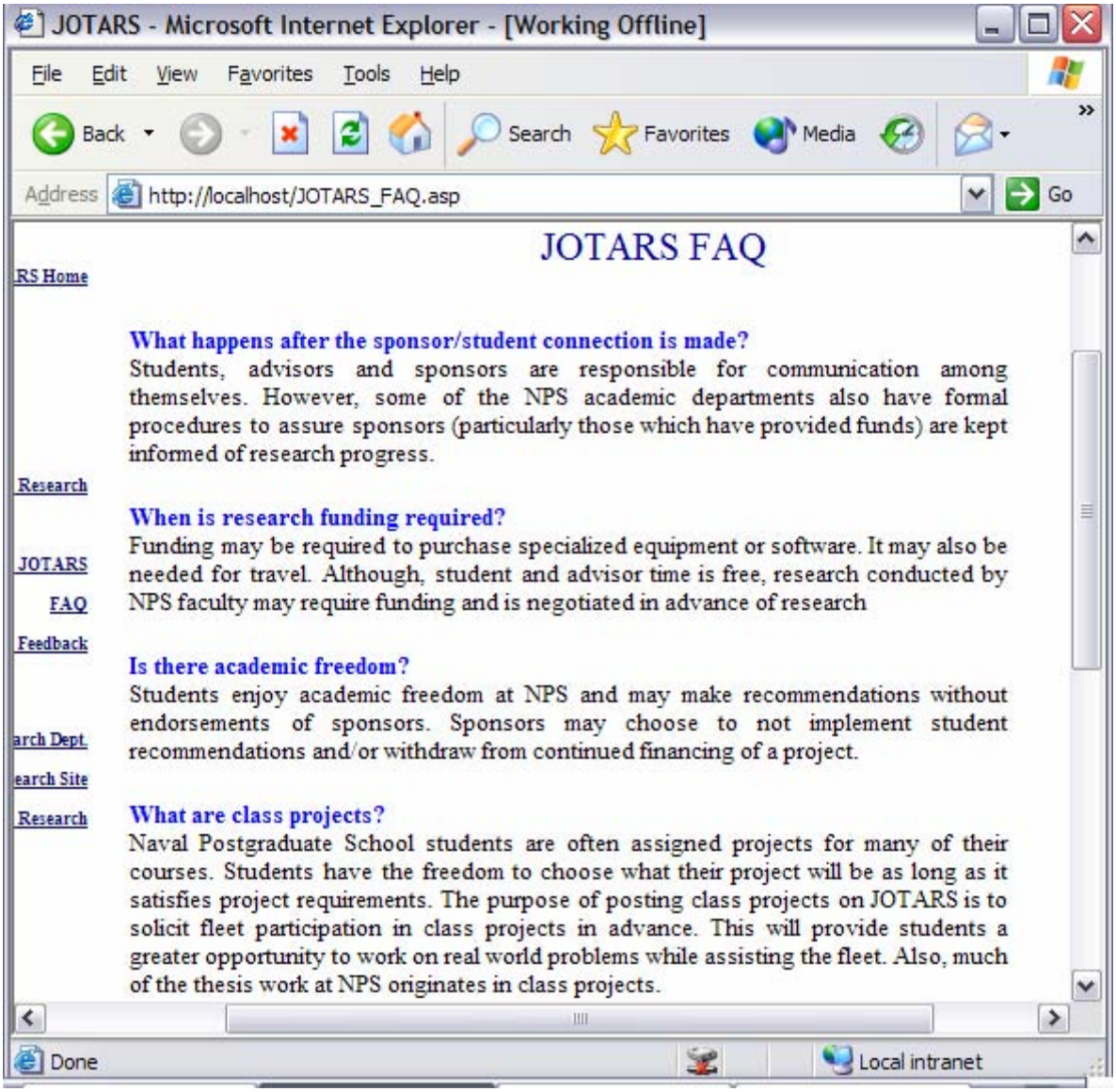

Figure 42. Frequently Asked Questions Screen Shot

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V. DEVELOPMENT METHODS AND LESSONS LEARNED

A. DETERMINING USER REQUIREMENTS

Journalistic interviews were used in determining user requirements. The author also used his own experience as a NPS student and from previous duty stations. Interviews resulted in a good understanding of issues but the author did not find user suggestions to be especially helpful. They either attempted to expand the scope of this project or fixated on business rules such as how long postings would remain active. An example of expanding scope was a follow-up system component to help facilitate communication after connections have been made. That may be a helpful component for a future development but goes beyond the primary goal of making the connection. The author considered the entire process and applied the eBay model to determine requirements. That is how the class project component became a requirement as none of the interviewees was particularly interested in this aspect.

The reasoning behind including class projects is that they comprise a significant amount of research at NPS. It is also the most underutilized in providing support to DOD organizations. Having the class projects component also helps in implementation by allowing NPS the opportunity to push research out to DOD organizations and make it easy for them to participate.

B. DEVELOPING THE PROTOTYPE

Rapid prototyping was utilized and incremental improvements and functionally were added. Prototypes were helpful in determining user requirements and especially helpful in refining user interfaces. One of the things learned was that users are not proficient at reading instructions on web sites.

Dreamweaver was the web site development tool utilized to build JOTARS. The author found that building the prototype and writing code to be the most challenging aspect of this thesis. Web sites DrDev [7] and Macromedia Exchange [8] provided helpful Dreamweaver tutorials and extensions.

Additionally, the “Help” tool in Dreamweaver also provided a lot of assistance. Because the author began this project with little experience using Dreamweaver, each new function and feature required learning time and research. Therefore, the limiting factor in design features and functionally was the ability of the author to write code.

C. TROUBLESHOOTING

Enabling Internet Explorer to view http coding errors was helpful in finding the source of errors by line number in the code. Although there are numerous different ways to accomplish desired functionality in code, the solution used must not have any errors. For example, an extra space or misspelling can cause an error, which can be difficult to identify. A notable frustrating problem encountered were errors when there was a session time out and the author was not aware there was a time out. The author then began a process of making small changes to a page’s code in an attempt to solve a nonexistent problem. This was also the case when there was an unknown problem with the field size, field type, or naming convention of the database. For example, the use of “reserved words” to name database fields will allow the database alone to function correctly; however, when accessed through the server using the internet (http protocol) error messages will occur which do not identify the nature of the problem. Having back-up files was helpful to go back to a point in time where a function was working correctly.

As new pages were developed, many were built using the foundation of existing pages. In some cases this resulted in code on pages which were not needed and caused errors as only partial deletions of behaviors or code were difficult to diagnose and repair. The author found that sometimes the best way to eliminate or correctly identify problems was to restart pages from scratch. Functionality could then be added and tested incrementally in order to find errors. Another approach was to eliminate and test functionality until errors were

eliminated. A back-up file could then be used to recover the good code and only the problem code would need to be either repaired or deleted.

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VI. IMPLEMENTATION STRATEGY

A. OVERCOMING RESISTANCE TO CHANGE

It is the author's opinion that users will embrace changes which make their lives easier without extra effort on their part, and JOTARS was built with that in mind. Students will undoubtedly embrace JOTARS once it is sufficiently populated. DOD organizations will also embrace the opportunity to tap into NPS research.

The author expects the leading resistance to be from NPS professors because they have the least to gain, particularly so with class projects. Many professors already have their own channels for finding research and research dollars. Professors may also be reluctant to post research topics for fear of someone else stealing their ideas and/or sponsors. This can be overcome by posting topics in very broad terms. For class projects, professors will need to prepare in advance and field questions from inquiring organizations, but they may feel burdened with the responsibility to ensure high quality class project output and client satisfaction. It is the author's opinion that top management support is critical to overcome this resistance. Specifically, top leadership could establish the expectation that professors use JOTARS to post class projects which could benefit DOD organizations. This is in congruence with NPS' mission, and JOTARS has the capability to measure participation. It would seem difficult for a department chairman to justify not having any class projects from their department which could benefit the Fleet.

Another obstacle is in establishing JOTARS as NPS' central site for proposed research topics. Transitioning to a new system may not seem like a good idea to those who are comfortable with the web site or processes their department has in place. Here too is where top leadership has the opportunity to endorse and commit to implementing JOTARS. Like eBay, the more users JOTARS obtains, the greater in value it becomes to all users.

B. PILOT USERS

Pilot users were sought, with limited success in order to help refine requirements, identify bugs, and help populate the database. The USMC Representative at NPS has an active role with USMC students and communication channels with many USMC commands. The USMC students would make an ideal pilot group due to their relatively small numbers and wide representation in many academic areas. The Information Sciences Department would also be an excellent group because there are class projects for just about every class.

C. MARKETING STRATEGY

1. NPS

The first priority is to gain support and participation within the Naval Postgraduate School. Presence on the NPS web page is a good beginning. Next, faculty meetings and e-mailings could be utilized to solicit faculty participation, especially in the area of class projects. Students could be introduced to the site through daily web announcements, during school indoctrination and introductory thesis classes.

2. DOD Organizations

News articles generated by the NPS Public Affairs Officer could present JOTARS while highlighting many of the successful research projects which occur at NPS. An official message announcing JOTARS, its benefits and how an organization could participate would also be helpful. NPS also has a large alumni population who are reachable by e-mail and is already aware of the high quality research which occurs at NPS.

D. SITE MANAGEMENT

The NPS Research Department would be the most logical choice as content managers, and the Information Technology & Communication Services (ITACS) could manage the software.

VII. SUMMARY/ CONCLUSIONS AND FUTURE RESEARCH

A. SUMMARY / CONCLUSION

JOTARS is a web-enabled database which facilitates research related connections and communication among Naval Postgraduate School (NPS) students, professors and DOD organizations. It fits well with the NPS mission and offers great potential to the fleet. Implementation was identified by many as the greatest barrier to the success of JOTARS. Only time will tell, but it is the author's view that if the site is easy to use, intuitive and is the best tool available in meeting user needs then it will be embraced and become highly successful.

B. FUTURE IMPROVENMENTS AND RESEARCH OPPORTUNITIES

1. User Authentication

Automated authentication by e-mailing a verification code which activates at account. This would allow users to select their initial password. Authentication could also be accomplished by utilizing Common Access Cards (CAC). This would be the preferred method since user accounts, passwords, and security protocols are already established.

2. E-mail Alerts

Automated e-mail notifications of new postings which meet a user's customized search criteria would free students of the burden of continually visiting the site to view newly posted items. Automated alerts would also be helpful to notify users of posting expirations and when another user associates with their postings.

3. Merge Sites with the Air University (AU)

This would allow DOD organizations one location to post research topics. The missions of the schools are similar and JOTARS could be easily modified to include the new classes of users (AU students and AU faculty). The AU

ReasearchWeb lacks the functionality which allows DOD organizations the ability to interact directly with its site.

4. Follow-up Component

This would create a more formalized process for DOD organizations to view progress and communicate with students after research has begun.

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5. BOSUN The Dudley Knox Library Catalog for the Naval Postgraduate School [http://library.nps.navy.mil/uhtbin/cgisirsi/0/0/X/60/26/X] Sep 2004.

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7. DrDev [www.drdev.net/index.htm] Sep 2004.

8. Macromedia Exchange [http://www.macromedia.com/cfusion/exchange/index.cfm] Sep 2004.

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   Monterey, California

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